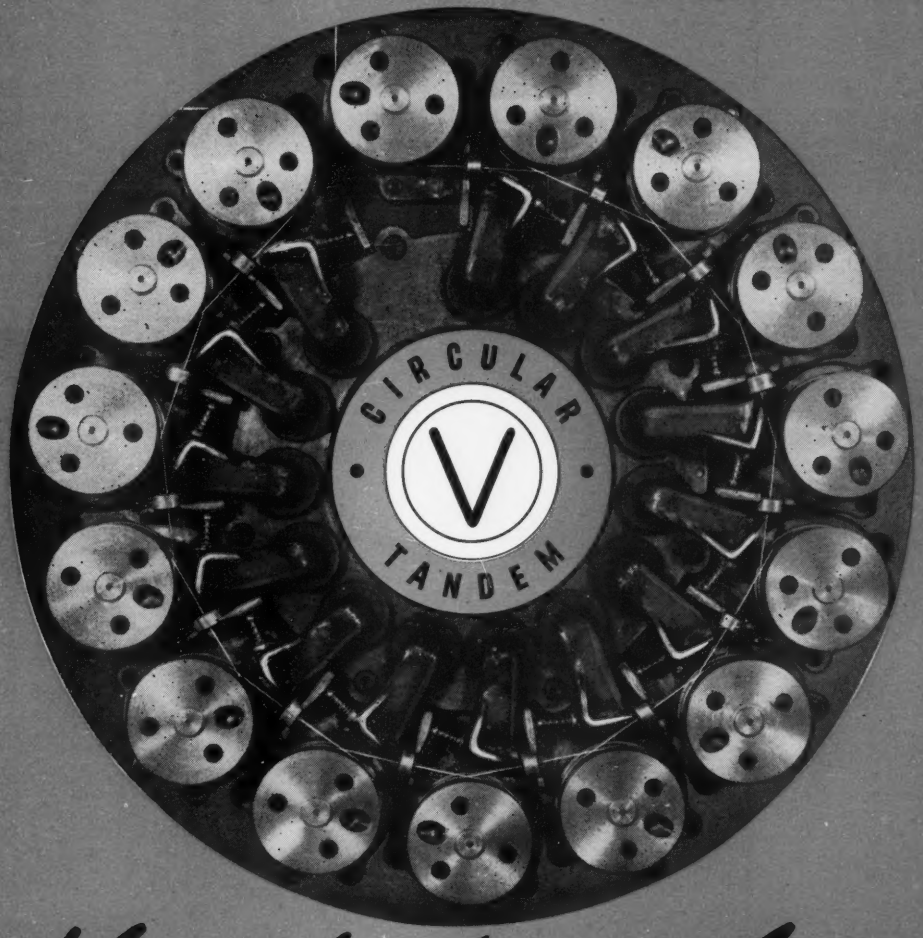
OCTOBER 1947

WIRE AND WIRE PRODUCTS



Vaughn Leads Again!

See pages 764-A, B, C, D

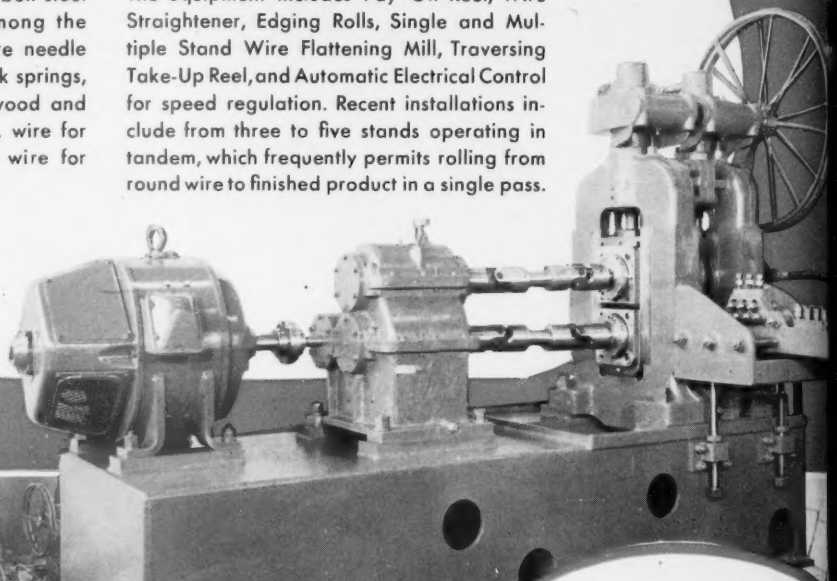
OFFICIAL PUBLICATION OF THE WIRE ASSOCIATION

WIRE FLATTENING

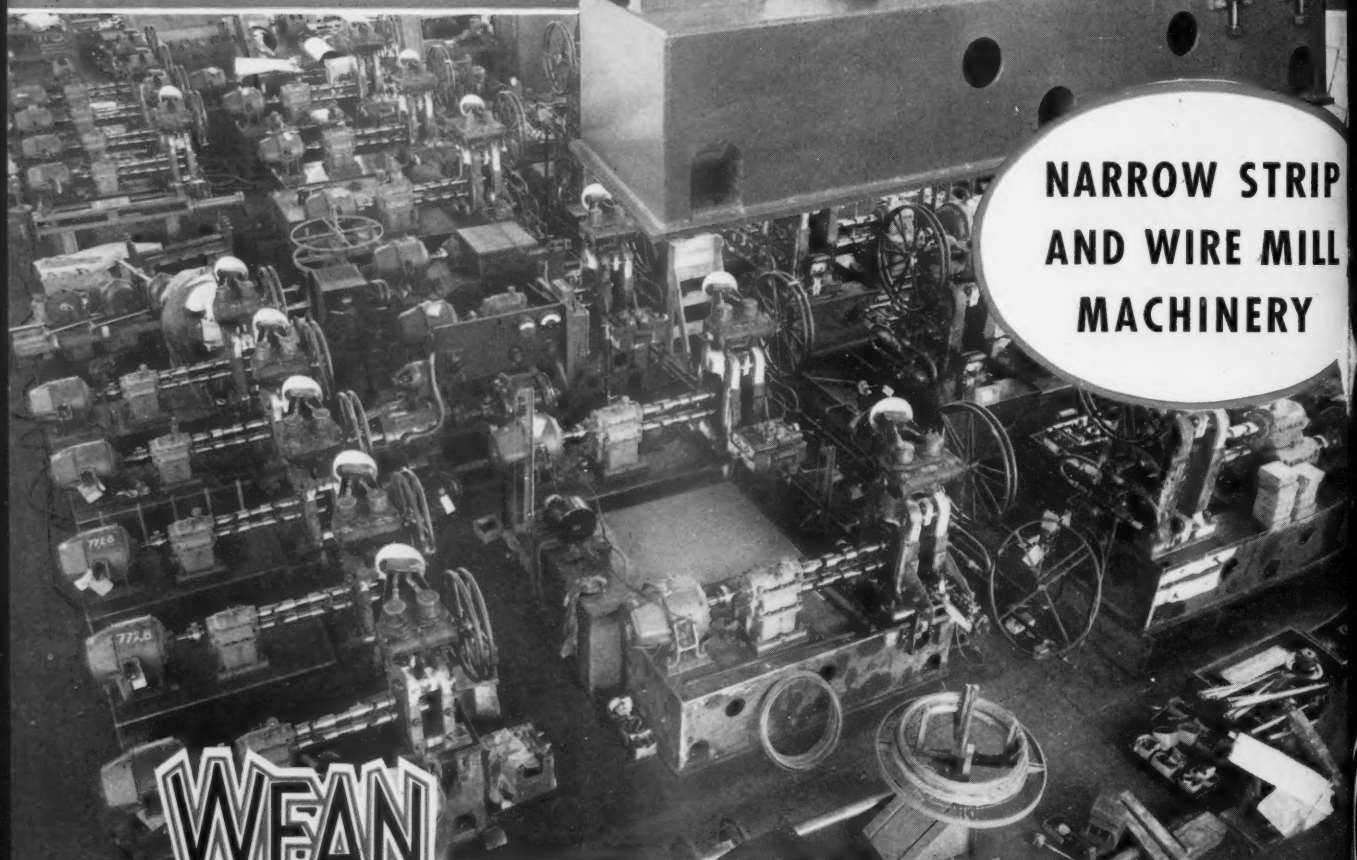
• The cold rolling of round wire in Wire Flattening Mills is an important production Process for producing flat and rectangular cross section wire to closely controlled tolerances in thickness and width. The process is applied to both low and high carbon steel wire and to non-ferrous wire. Among the products produced in this way are needle wire, spring wire for watch and clock springs, umbrella wire, fret-saw wire for wood and metal working, book-binding wire, wire for special steel springs, and copper wire for electrical coils

Wean Equipment Corporation has developed completely modern mills and annealing equipment for this purpose, designed and constructed to produce smoothly finished flat wire of excellent uniformity at high speed. The equipment includes Pay-Off Reel, Wire Straightener, Edging Rolls, Single and Multiple Stand Wire Flattening Mill, Traversing Take-Up Reel, and Automatic Electrical Control for speed regulation. Recent installations include from three to five stands operating in tandem, which frequently permits rolling from round wire to finished product in a single pass.

8" Single Stand Wire Flattening Mill with Wire Straighteners



General view (20 Mills on assembly line)



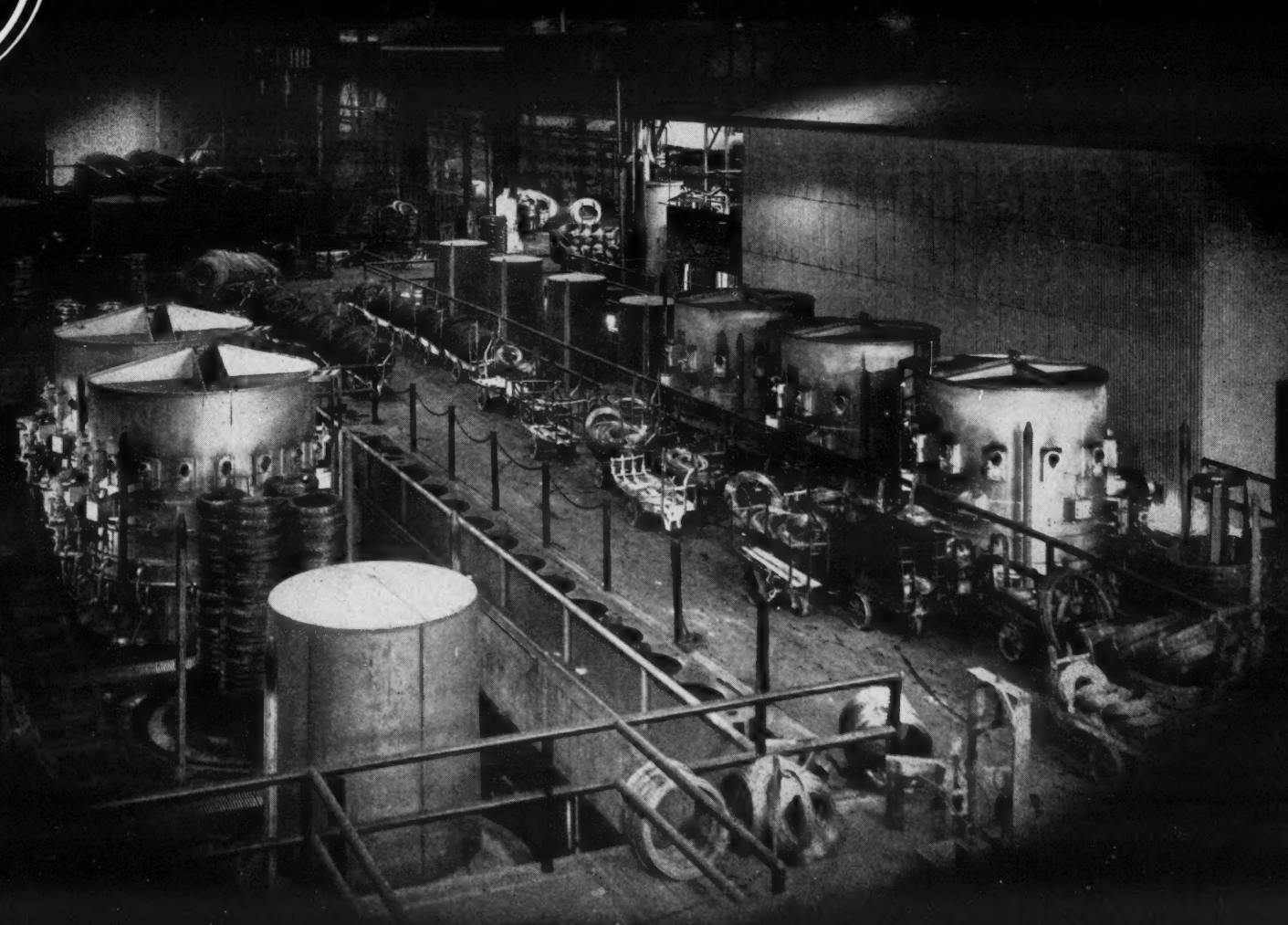
NARROW STRIP AND WIRE MILL MACHINERY

WEAN EQUIPMENT

Corporation

CLEVELAND, OHIO

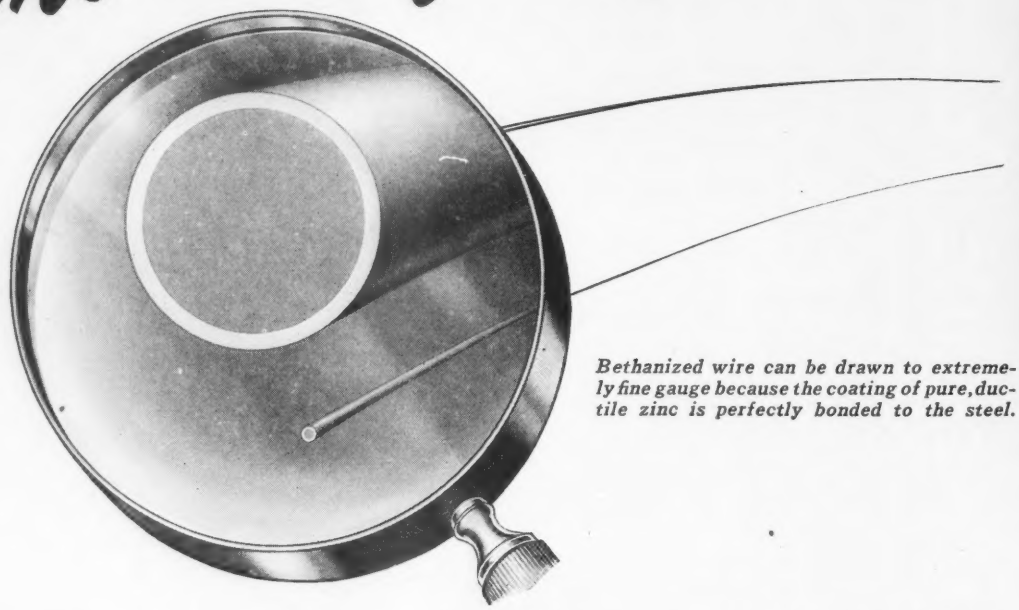
WILSON WIRE ANNEALING *Furnaces*



THIS COMPLETE WIRE ANNEALING & SPHEROIDIZING DEPARTMENT IS ANOTHER WILSON INSTALLATION

DRAWN THROUGH 49 DIES AND THE

Zinc coating stays put



Bethanized wire can be drawn to extremely fine gauge because the coating of pure, ductile zinc is perfectly bonded to the steel.

A request for the production of some 3-mil filament wire was tackled soon after the development of the bethanizing process by Bethlehem. It was decided to experiment by drawing fine wire directly from a 16-gauge (.0625 in.) soft steel wire having a coating weight of about 0.6 ounces of zinc per sq ft of surface. This bethanized wire was then successfully drawn through *forty-nine* dies to a diameter of 0.0033 inches *without any loss of zinc coating.*

This unusual test is proof, not only of the excellent ductility and perfect coating bond, but of the high-quality steel as well. Bethanizing is a unique electrolytic process by which pure zinc is deposited atom by atom in a uniform coating on the steel wire.

You can do a better job with bethanized wire. *Here's why:*

★ Ideal for Severe Forming. The ductile coating permits drastic deformation.

★ Extra Corrosion-Resistance. The coating is uniform and tightly-bonded.

★ Smooth, Lustrous Appearance. Here's extra sales appeal for wire products.

★ Coating Weights to Fit the Job. Any predetermined weight of zinc within practical limits can be applied.

★ Long Coating Life. The zinc is 99.9 per cent pure.

★ Wide Range of Tempers. Whether temper must be hard or soft, the wire can be bethanized.

We suggest that you plan now to give bethanized wire a test in your plant. Just phone the nearest Bethlehem district office or drop a line to us at Bethlehem, Pa.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

★ Bethanized Wire ★

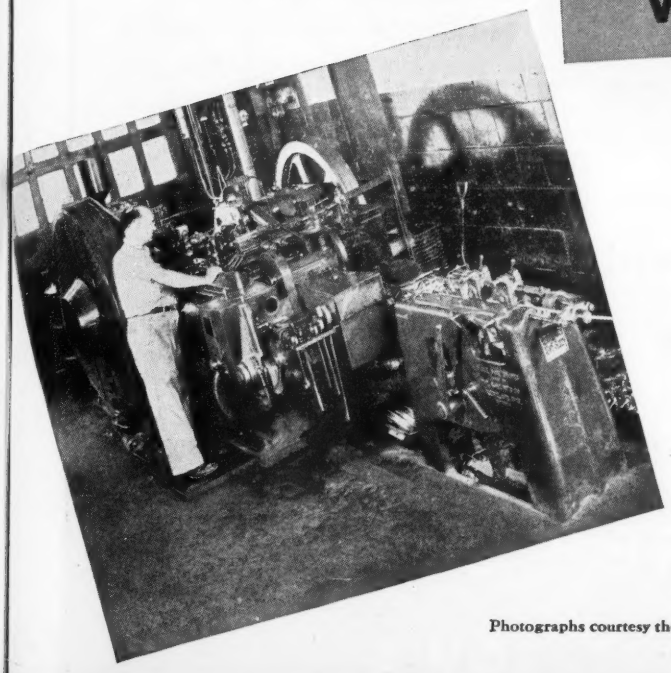
BETHLEHEM STEEL

WIRE & WIRE PRODUCTS, Vol. 22 No. 10, October, 1947, Publication Office, at 61 Cliff St., New York 7, N. Y. Executive Office, 300 Main Street, Stamford, Conn. Published monthly by the Quinn-Brown Publishing Corp., Richard E. Brown, President; R. S. Spengel, Secy. and Treas. Subscription price: U. S., $5.00; Canada, $5.00 per year; 50 cents per copy; Foreign, $7.50 per year. Entered as second class matter, June 14, 1946, at the Post Office, New York, N. Y., under Act of March 3, 1879.

COLD HEADERS NEED

AJAX-HOGUE

WIRE DRAWERS



THE efficiency and quality of product of Cold Headers is materially stepped-up by the attachment of AJAX-HOGUE wire drawers. The wire, being freshly drawn to unvarying diameter as it is perfectly coated and fed to the header dies, heads easier, more uniformly and with much less wear on the header dies. This improvement in cold heading substantially lowers the cost of production in addition to the saving effected by the use of hot rolled rod instead of cold drawn wire.

Write for Bulletin No. 111.

Photographs courtesy the Chandler Products Corporation.

THE AJAX MANUFACTURING COMPANY

EUCLID BRANCH P. O. CLEVELAND 17, OHIO

110 S. DEARBORN ST. CHICAGO 3, ILLINOIS

DEWART BUILDING NEW LONDON, CONN.

ROUND OR FLAT

WIRE

BY NICHOLS

ALUMINUM — COPPER — STEEL (LOW CARBON)

Coarse — Intermediate — Fine Gauges

IN COILS – STRAIGHT NED AND CUT

produced at

BATTLE CREEK, MICHIGAN • DAV ENPORT, IOWA

NICHOLS WIRE AND STEEL CO.

DAVENPORT, IOWA

V-R

TANTALUM/TUNGSTEN CARBIDE DIES!

assure you of...

1. GREATER STRENGTH: Tapered nib design increases absorption of drawing stresses. Side walls of nib are taper-gripped resulting in tremendous die strength.

4. CONCENTRICITY: V-R method of precision die manufacturing assures you of a perfect, concentric drawing surface.

2. SIMPLE MAINTENANCE: Tapered-grip casing means no steel casing to cut for refinishing or resizing... a real time and cost saver!

5. FREE OF POROSITY: Another outstanding achievement is the V-R die quality control for the elimination of porosity in carbide. In addition, V-R Tantalum/Tungsten carbide die nibs take a higher finish than any other die material.

3. MAXIMUM VISIBILITY: Extra wide tapered front and back openings permit simple, easy inspection, better lubrication.

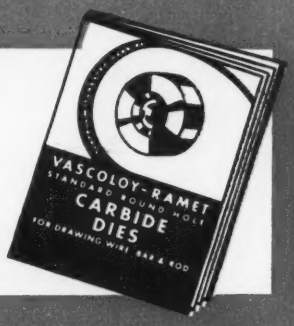
For unsurpassed performance, V-R carbide dies for wire, tubing, bar and rod, cost less than any other die material!

Comparative performance, in addition to exhaustive laboratory tests and wide spread, practical field applications, place V-R carbides at the forefront of carbide die design and development.

REMEMBER TOO, V-R carbide dies are precision engineered by cost-conscious V-R engineers to reduce YOUR carbide die costs.

MAKERS OF WORLD'S FINEST V-R Carbides

Send for your free copy of the Vascoloy-Ramet Standard Round Hole Die Catalog. Address Dept. WW647.

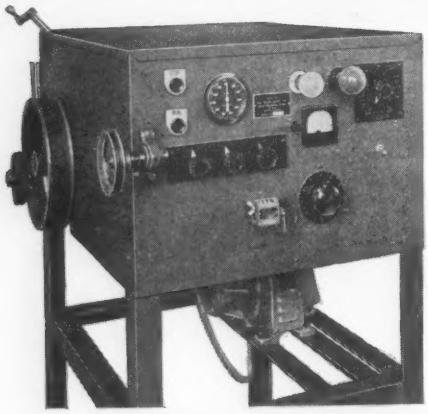


For increased wire, rod or bar production performance call your nearest Vascoloy-Ramet Field Engineer — the man who knows the solution to your carbide die problems.

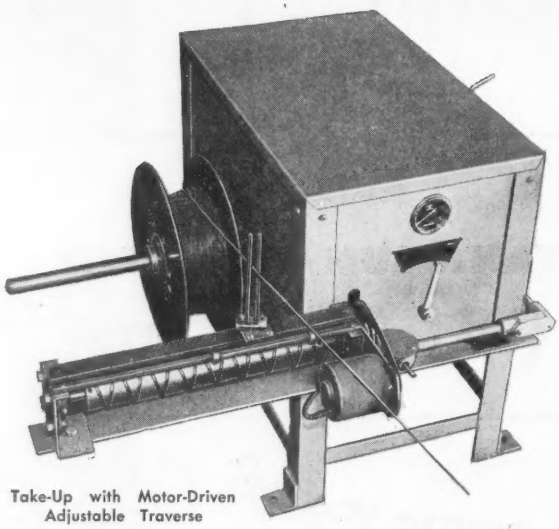
VASCOLOY-RAMET CORPORATION NORTH CHICAGO ILLINOIS. U. S. A.

District Sales and Service in Principal Cities

AN AFFILIATE OF FANSTEEL METALLURGICAL CORPORATION AND VANADIUM ALLOYS STEEL COMPANY



Capstan, Spark Tester
and Speed & Tension Control for Take-Up



Take-Up with Motor-Driven
Adjustable Traverse

DAVIS SPARK TESTER AND TAKE-UP

For Thermoplastic Extrusion of Small Wires

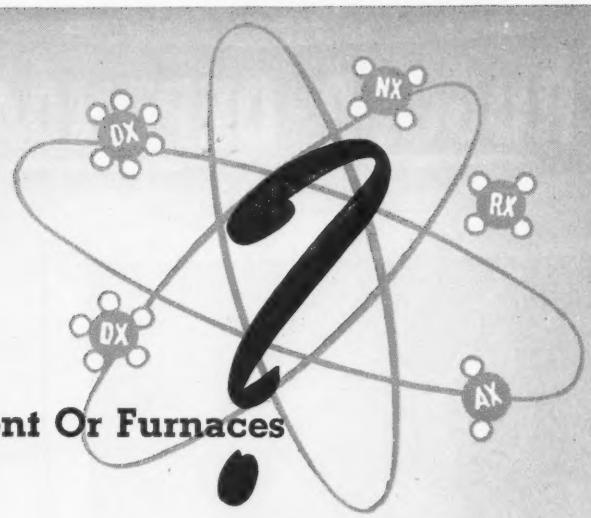
The Capstan and Control Unit embodies the Davis Spark Tester and Tension and Speed Control for take-up. The Take-Up Unit is motor-driven and has an adjustable Traverse.

The Take-Up is governed by the Control Unit, which is contained in the same housing with the Spark Tester and Capstan. The result is an economy of floor space, plus convenient centralization of control for the Spark Tester, Capstan and Take-Up at one point. However, terminals for additional start-and-stop button may also be located at outside points.

DAVIS
EQUIPMENT
FOR THE
WIRE INDUSTRY

SPARK TESTERS • SPOOLERS • TAKE-UPS • CAPSTANS

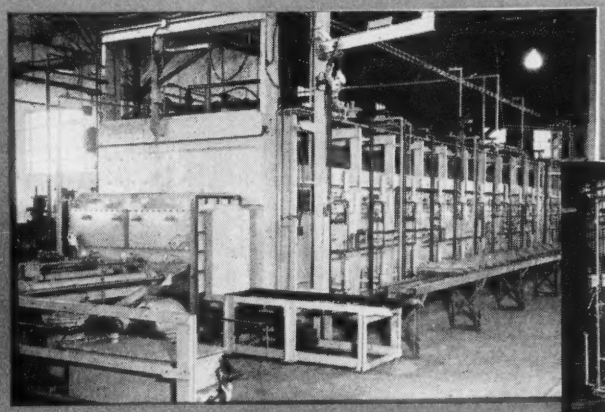
THE R. L. DAVIS ELECTRIC CO., INC., WALLINGFORD, CONN.



Any Questions On The Science Of Gas Chemistry, Heat Treatment Or Furnaces

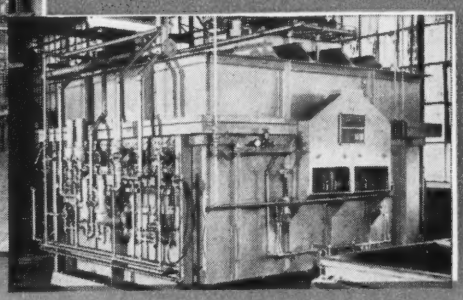
Progress in heat treat practice and the equipment which makes it possible is moving at a rapid pace; for instance Radiant tube heating, carefully controlled furnace atmosphere with new improved furnace design—all 'Surface' developments. These result in improved product and greater economy in production.

Some of the 'Surface' engineers responsible for these significant developments will be available in our booth No. 617 (Arena) at the Metals Exposition, International Amphitheatre, Chicago. We would like to have you meet them. Ask questions. Discuss your problems, get their views and take advantage of their special experience. You will be most welcome.



SC Continuous Tray Pusher
Radiant Tube Furnace

'Surface' Rotary Hearth Type Furnace
Radiant Tube Heated



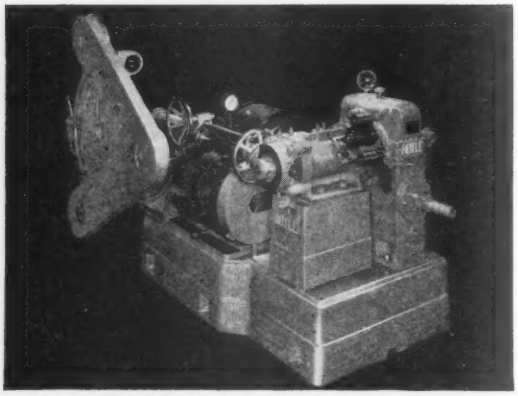
*SPECIAL RADIANT-TUBE HEATED, ATMOSPHERE FURNACES FOR: Gas Carburizing and Carbon Restoration (Skin Recovery), Clean and Bright Atmosphere Hardening, Bright Gas-Normalizing and Annealing, Dry (Gas) Cyaniding, Bright Super-Fast Gas Quenching, Atmosphere Malleableizing, Atmosphere Forging, and Specific Effects upon Metal Surfaces.

'Surface'

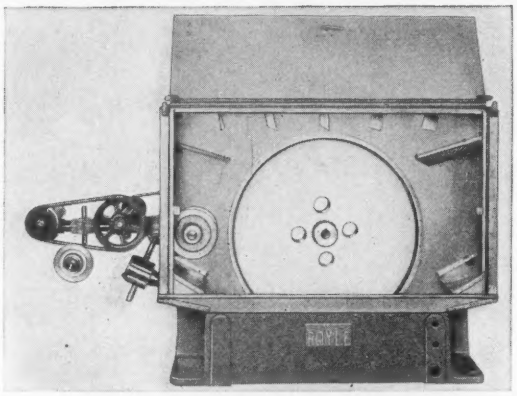
2822

SURFACE COMBUSTION CORPORATION • TOLEDO 1, OHIO

RUGGED-DEPENDABLE-ADAPTABLE

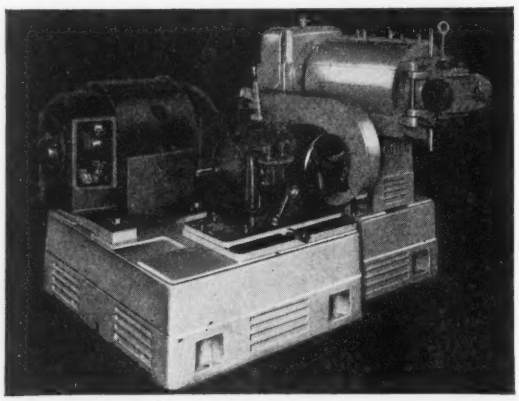


CONTINUOUS VULCANIZING MACHINE



36" CAPSTAN PLASTIC INSULATED WIRER

NUMBER 5 STRAINING MACHINE



No. 2. PLASTIC INSULATED WIRE MACHINE

ROYLE PRODUCTS

Continuous Extruding Machines for the Rubber, Plastic and Chemical Industries

Continuous Vulcanizing Machines for Rubber Insulated Wire

Plastic Insulated Wire Machines	Light Wire and Cable Capstans
Strainers	Motorized Take-Ups
Cooling troughs	Temperature Control Units

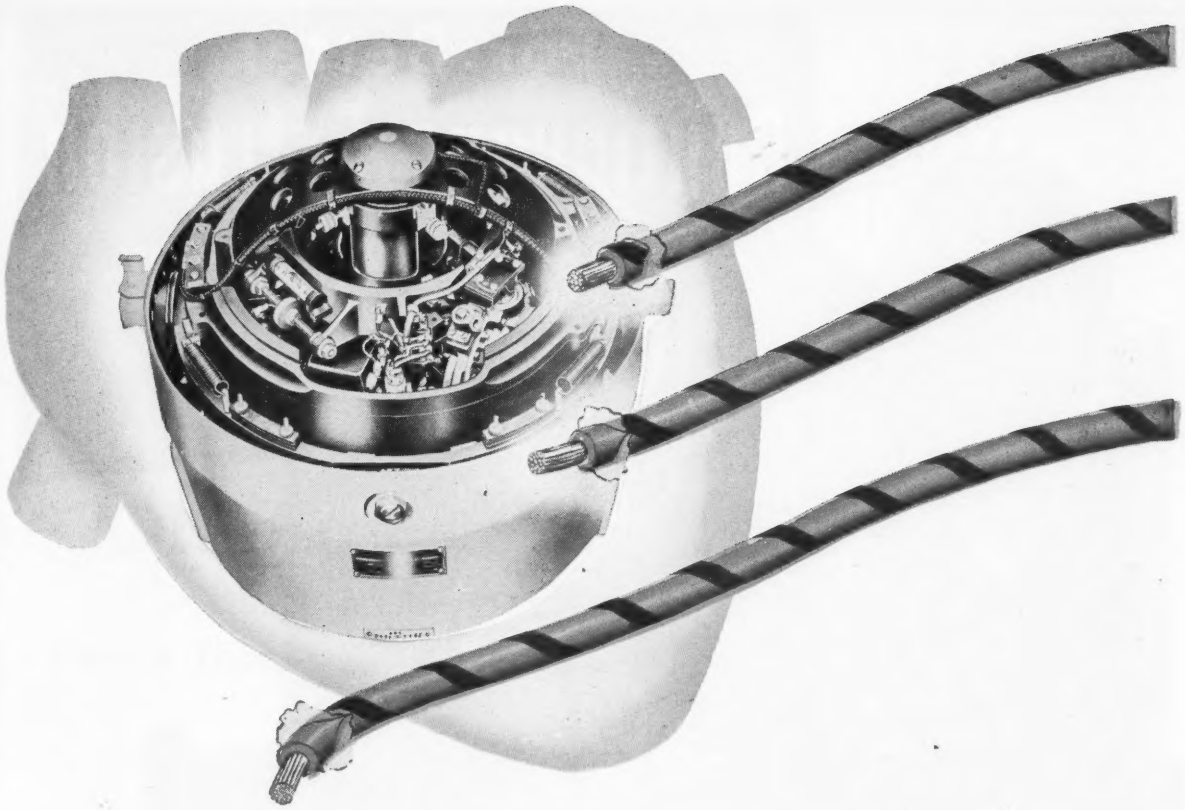
JOHN ROYLE & SONS

ROYLE PATERSON N. J. 1880

PIONEERED THE CONTINUOUS EXTRUSION PROCESS IN

London, England	Home Office	Akron, Ohio	Los Angeles, Cal.
James Day (Machinery) Ltd.	E. B. Trout J. W. VanRiper	J. C. Clinefelter	H. M. Royal, Inc.
REgent 2430	SHerwood 2-8262	JEfferson 3264	LOgan 3261

PATERSON 3, NEW JERSEY



ARTERIES FOR A SHIP'S HEART GET PROTECTION WITH DU PONT NYLON

In wiring for the Arma gyro compass, tough, long-lasting nylon jacketing resists heat, oils, abrasion, and flexing

The heart of a modern ship is the gyro compass—which tells the navigators what course they're on.

Arma Corporation of Brooklyn, N. Y., makes gyro compasses for the Navy. Naturally, they make them with the best materials obtainable. And that's why they're using connective wiring jacketed with Du Pont nylon.

Arma says that before adopting this wire jacketed with nylon they tested wire with many and various jacketing materials. None before nylon met the rigid specifications. None sufficiently withstood lubricating oils, heat and hard mechanical abuse.

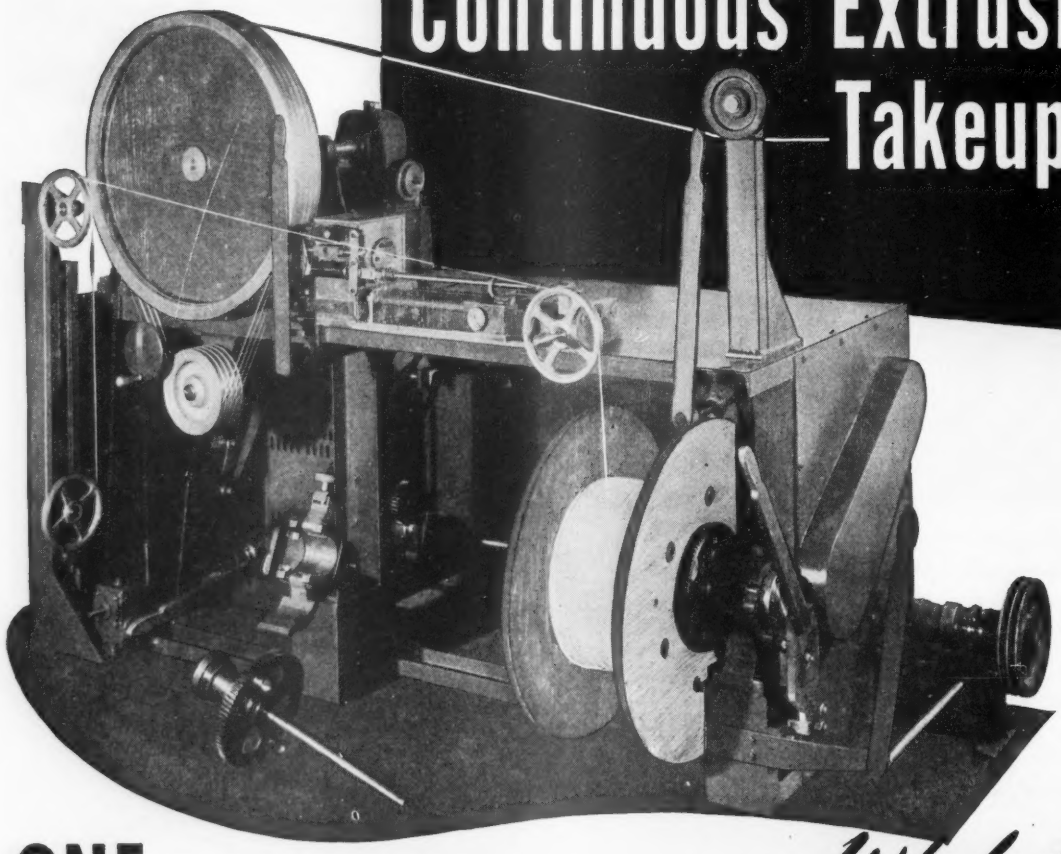
Nylon-jacketed wire not only meets every one of the specifications, but a much thinner jacket is required than with previous jacketing materials, and thus space is saved.

Surprenant Manufacturing Company of Boston, manufacturer of the wire, has this to say: "As an extrusion jacket of protective covering on wire, nylon is unsurpassed in present-day thin-wall extrusion. The abrasion resistance of nylon is greater than that of any existing material used in a like manner. Nylon has a 'slick' surface that allows easy movement through narrow apertures. In addition it has the desirable properties of very high tensile strength and great extensibility. Compression strength, necessary especially in a protective covering, is more than adequate. To these properties can be added the more apparent features of ease of extrusion with proper controls and ability to color in delicate shades when required."

When you think of jacketing for wire and cable, think of Du Pont nylon. It is tough and abrasion-resistant, able to stand flexing and rubbing over extended periods. It can resist heat, oils, many chemicals, salt water and fresh water, and aging. Write us *today* for more information. E. I. du Pont de Nemours & Co. (Inc.), Plastics Department, Room 1510, Arlington, New Jersey.

DU PONT
REG. U. S. PAT. OFF.
Plastics
BETTER THINGS FOR BETTER LIVING
...THROUGH CHEMISTRY

For Better Continuous Extrusion Takeup...



ONE COMPACT MACHINE DOES THE *Whole Job!*

That's all it takes—just *one* compact machine to perform all the functions involved in continuous extrusion takeup operations. There is no need for separate capstans, lineshafts, tension stands or other propelling and winding equipment.

This new type constant tension continuous takeup with integral capstan and drive was developed as the result of many years of experience by IOI engineers in the design of winding equipment.

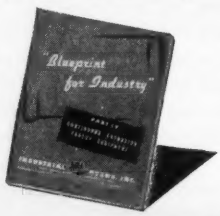
The machine features an adjustable constant tension reel drive and an ingenious and efficient system of loading and unloading reels without interrupting the winding process. A cantilevered demountable alloy shaft assembly makes reel loading and unloading a simple and easy operation that eliminates the possibility of damaging the reel flanges.

Precision traverse mechanisms of various types developed by IOI to level lay wire provide either automatic or manual crossover from full to empty reel. Standard traverse for high speed extrusion operations, as illustrated above, has single large diameter reversing screw with wide lay range and stroke adjustment.

For smooth propulsion of wire tubing or monofilament, IOI takeups employ large, easily threaded, positive grip driving capstans with fleeter sheaves. Capstans are lightweight, precision-machined, and balanced dynamically for top operating speeds. Capstan and reel drives are hydraulically synchronized so that one speed adjustment controls both.

Heat at Work...in CONTINUOUS OPERATIONS

For complete detailed information on this new takeup machine—as well as other recent IOI *developments in continuous extrusion equipment—write for "Blueprint for Industry" Part IV, fully illustrated with photographs and engineering drawings. It's free for the asking.*



IOI ENGINEERING VERSATILITY

INDUSTRIAL OVENS, INC.

13825 TRISKETT ROAD CLEVELAND 11, OHIO

ASSOCIATED COMPANY: JAMES' DAY MACHINERY LTD., LONDON W.1, ENGLAND

STANDARD · INDUSTRIAL
STANDARDIZE WITH STANDARD
COMPOUNDS CO.
INCORPORATED
Manufacturers-Metal Working Compounds
4600 W. FERDINAND ST. · CHICAGO 44, ILLINOIS

CONVENTIONS . *mean Cooperation*

Frank Interchange of "Know Hows" and "What Nots"

It's a Way we have in America!

Once again we join our fellows in the MIDWEST in welcoming the members of the entire WIRE PRODUCTS INDUSTRY to the hospitality of "Convention in Chicago".

Not only is Chicago the national crossroads of rail and highways but world junction of the Airways as well. It is the easiest place to reach on the continent.

This convenience, together with the vital importance of the problems that call for open discussion and decision TODAY, should bring an attendance excelling any in the past. We most heartily welcome you all.

Come a running!

STANDARD INDUSTRIAL COMPOUNDS CO.

MICROMETER PRECISION MICRO-WELD TRADE MARK REG. U. S. PAT. OFF.

MICRO PRODUCTS COMPANY

EXTENDS HEARTY GREETINGS TO ALL MEMBERS AND GUESTS OF

THE WIRE ASSOCIATION

MICRO-WELD BUTT WELDERS ARE MANUFACTURED IN DIFFERENT MODELS TO BUTT WELD HIGH AND LOW CARBON STEEL AND STEEL ALLOYS IN SIZES FROM .004" TO 1¼" DIAMETER, AND NON-FERROUS WIRE AND RODS RANGING IN SIZE FROM .004" TO 7/8" DIAMETER

A WELDER FOR EVERY PURPOSE

DISCUSS YOUR WIRE WELDING PROBLEMS WITH OUR MR. G. L. MAY, WHO WILL BE IN ATTENDANCE DURING THE CONVENTION

MICRO PRODUCTS COMPANY

20 NORTH WACKER DRIVE, CHICAGO 6, ILL.

Cable address: MICROWELD, CHICAGO

Telephone: STATE 7468

Soaps and Compounds for..

BRASS & BRONZE

HIGH CARBON

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LOW CARBON

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STAINLESS STEEL

SPRING WIRE

TOOL STEELS

DRY AND WET DRAWING OF FERROUS AND NON-FERROUS WIRE, TUBING, AND DEEP DRAWN PARTS

Our Engineers Will Be Glad to Cooperate With You in Finding the Most Economical and Efficient Solution to Your Drawing Problem.

Write or Teleprone

R. H. MILLER CO., Inc.

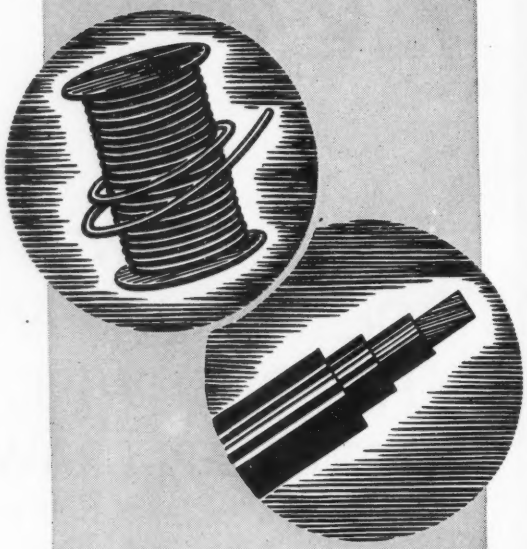
HOMER, New York

Established 1909

Specialized

RESEARCH EXPERIENCE

In Insulating Wire Finishes



You are invited to attend a meeting of minds between your engineering staff and ours. The experience of our technical staff embraces all types of insulating finishes to meet the most exacting requirements.

Every formulation is engineered to individual specifications for the particular service required.

Special emphasis should be directed to our non-toxic, flame proof, impregnating compounds and solutions. Also to all types of wire and cable lacquer coatings.

STANDARD VARNISH WORKS

Engineers of Product Finishes

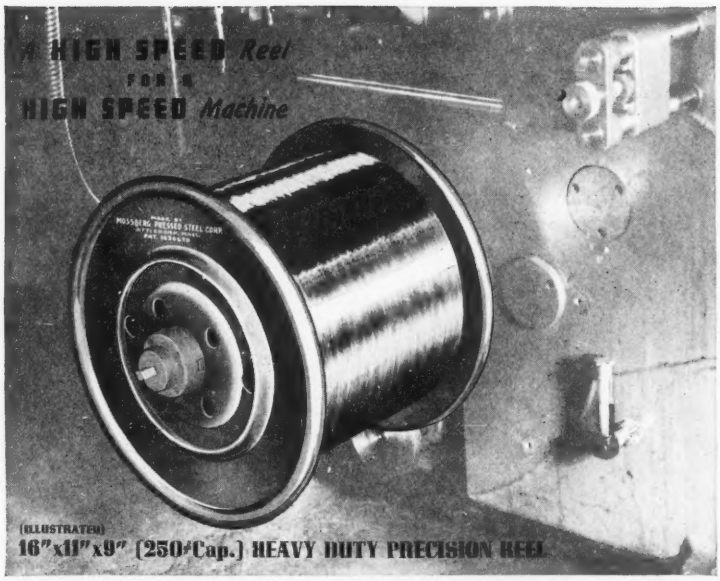
NEW YORK — CHICAGO

SERVING INDUSTRY FOR 75 YEARS

WELCOME

GREETINGS

1947



MOSSBERG PRESSED STEEL CORP.

OFFERS: BALANCED PRECISION REELS

in HEAVY DUTY construction for use on modern HIGH SPEED wire drawing machines.

To provide higher operating efficiency, with the ever increasing tendency towards the drawing of finer gauge wire on larger reels at higher speeds, the following reel requirements are now essential:

(1) PROPER PROPORTION
(2) BALANCE
(3) ACCURACY
(4) STRENGTH
(5) DURABILITY

All these requirements are incorporated in spools & reels made by

MOSSBERG PRESSED STEEL CORP.

18 WEST STREET ATTLEBORO, MASS. U. S. A.

---

to the

Annual Convention of the Wire Association

You Are Invited to Join . . . . .

THE WIRE ASSOCIATION

To those wire mill men who have not already joined the Wire Association for the mutual benefit of those engaged in the operating end of the Wire Industry, a cordial invitation is extended to become a member.

If you are making rods and wire—of steel, copper, brass, alloy or any ferrous or non-ferrous metal, or are in the wire products end—nails, bolts, screws, rivets, wire rope, wire cloth, springs, electric wire and cable or any of the numerous products made of wire, you will benefit by identifying yourself with the Association.

The Wire Association is a non-profit organization of wire and wire products mill superintendents, executives and foremen, whose specific purpose is to improve production methods and afford a clearing house for ideas on management, technical and research problems, and to develop and maintain friendly relations among members.

Dues, including a subscription to WIRE AND WIRE PRODUCTS, a copy of the BUYERS GUIDE and the various services to members, $15.00 per year. Please write today for a membership application card.

THE WIRE ASSOCIATION

Richard E. Brown, Executive Secretary

300 MAIN STREET STAMFORD, CONN.

A 40-FOOT MUFFLE

made of a metal that resists

HIGH TEMPERATURES and BRIGHT ANNEALING ATMOSPHERES

Photo shows muffle as made in two parts for easier handling. When installed, the unit will be bolted together at flanges. Muffle was fabricated entirely out of ¼" Inconel plate by Michigan Steel Casting Co., Detroit. The inherently sound structure of rolled Inconel makes this high-Nickel alloy ideally suited for all types of high-temperature muffle construction.

When this "king-size" muffle is installed in the plant of W. M. Chace, Detroit, it will be used in the bright annealing of bi-metal and alloy strip.

It will have to stand temperatures up to 1850° F...

It will have to resist the embrittling effect of dissociated ammonia..

...and it will!

For this muffle is made entirely of Inconel*.

Inconel is an 80 Nickel-14 Chromium alloy developed specially for high-temperature duty. It is strong, and retains its strength at high temperatures. It resists embrittlement by hydrogen. It does not scale away through oxidation. It resists practically all the corrosive atmospheres encountered in heat-treating operations.

Investigate Inconel whenever you need a sound, rolled metal offering resistance to heat... stress... oxidation... corrosion. It's a thermally durable metal that's available in all common mill forms.

If you want to learn how Inconel performs, just ask one of your friends who has already used this INCO Nickel Alloy... or, send for, *"For Long Life at High Temperatures."* *Reg. U. S. Pat. Off.

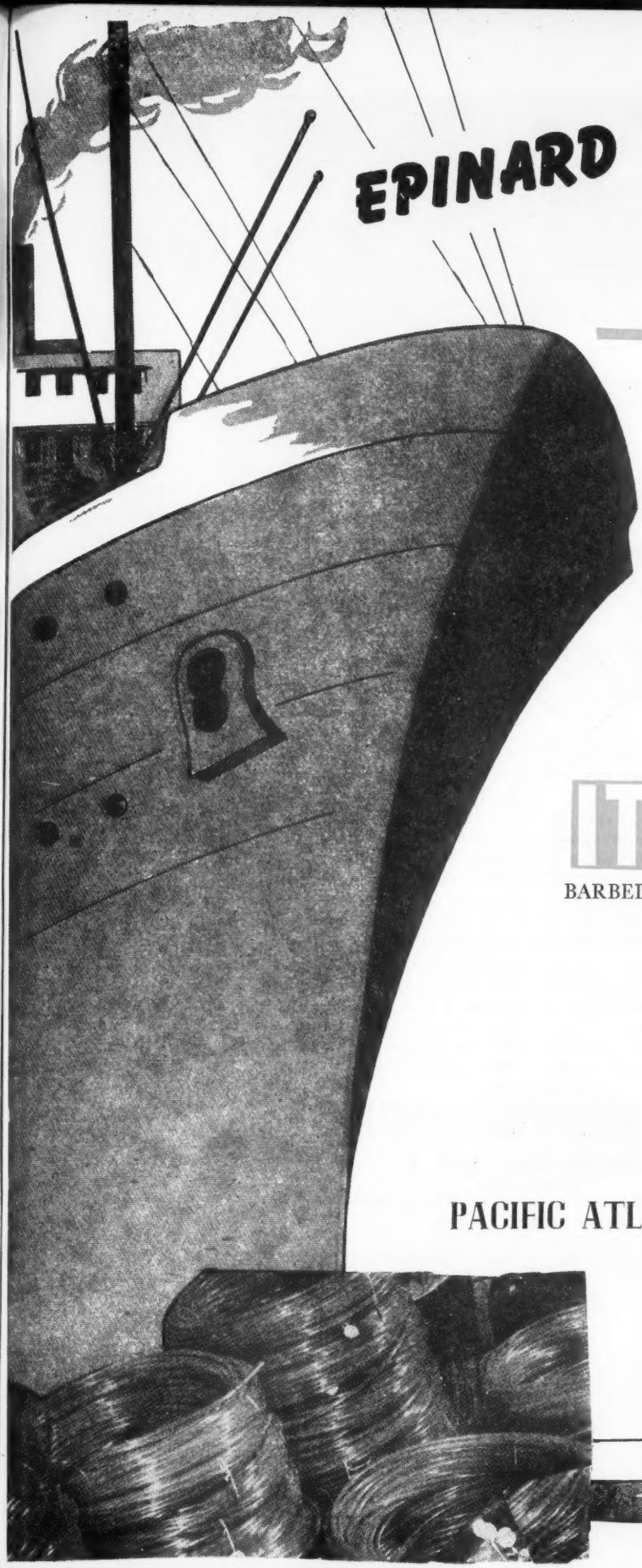
THE INTERNATIONAL NICKEL COMPANY, INC., 67 Wall Street, New York 5, N. Y.

EMBLEM OF SERVICE INCO TRADE MARK

INCONEL ...for long life at high temperatures

(80 NICKEL-14 CHROMIUM)

Tough cold-heading jobs come out clean
WITH THIS SPECIAL-ANALYSIS WIRE
Recessed head screws of all kinds are among the many difficult jobs that ARMCO Stainless Steel Cold-Heading Wire takes in stride.
The Rustless Division of Armco, world's largest producer of stainless steel wire for cold-heading, makes this special rustless steel wire for cold upsetting. The work hardening rate is low, which facilitates slotting and increases tool life.
When you use ARMCO Cold-Heading Wire you can expect to get coil after coil right in line with your specifications, both in temper and size. It comes to your plant with a uniform coating that assures a smooth, easy flow in the dies from start to finish.
QUICK DELIVERY
Besides a trim, clean-cut appearance, ARMCO Cold-Heading Wire gives your products all the other advantages of stainless steel — great strength and exceptional resistance to corrosion, staining and high heat.
You can get quick delivery of ARMCO Cold-Heading Wire by writing or phoning The Rustless Division, The American Rolling Mill Company, 3431 East Chase St., Baltimore, Md.
ARMCO COLD-HEADING WIRE
Rustless
DIVISION OF ARMCO



EPINARD de WITT LTD.
SAYS

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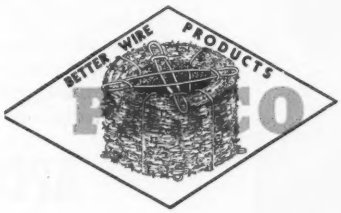
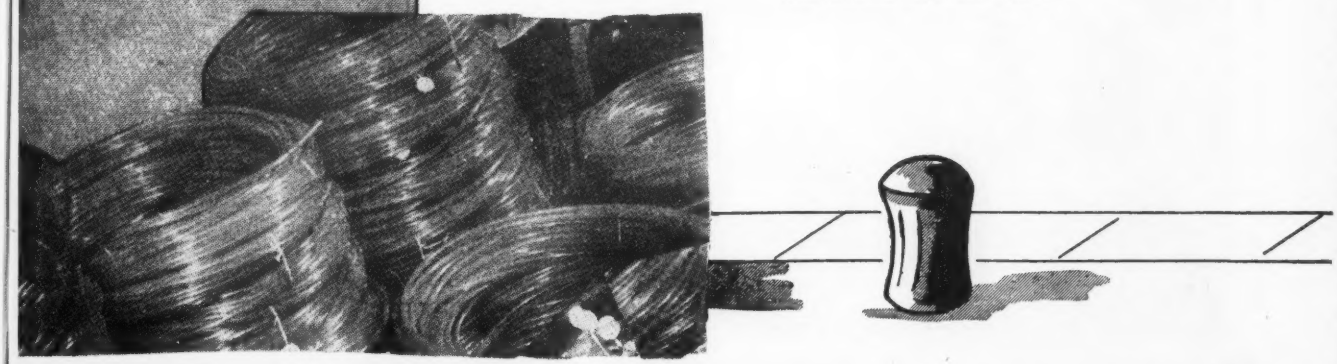
BARBED WIRE — NAILS — STAPLES



PACIFIC ATLANTIC STEEL CORPORATION

WIRE ENGINEERS AND MANUFACTURERS



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To meet your requirements

If it can be wound on a reel, spool or bobbin, Apco Mossberg can fill your needs.

For over 50 years we have specialized in the manufacture of spools and reels of all kinds. Our plant is fully equipped with modern machinery to manufacture almost any conceivable kind, type and size of steel spool, reel and bobbin, in large quantities or small.

All inquiries are first referred to a fully staffed Engineering Department, where your requirements are carefully analyzed, and a product recommended—or designed—to satisfy your needs exactly. From start to finish a rigid inspection system guarantees a product uniform in size and quality.

A Service Department is maintained, and we will gladly send a representative to your factory to assist in any problem involving reels, spools or bobbins.

An interesting brochure, recently published, gives considerable useful information, illustrating and describing a few score of the various Apco Mossberg spools and reels that find the largest application in industry today. Write for a copy.

APCO MOSSBERG COMPANY

Attleboro, Mass., U. S. A.

Hugh Williams & Company • 47 Colborne Street
Toronto, Ontario, Canada

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MANY YEARS EXPERIENCE

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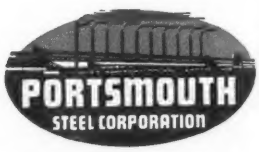
Manufacture of Low Carbon Special Wires for Cold Heading, Trade and Special Analysis High Carbon Rods, gives Portsmouth Steel Corporation complete background

for

our entry into the field of manufacture of specialty wires

M. B. Untempered Spring Wire
M. B. Oil Tempered Spring Wire
Rope Wire — All Grades
Weaving Wires and All Classes
of Fine and Specialty Wires.

OUR COMPLETE FACILITIES FROM ORE TO FINISHED WIRES PLUS COMPLETE METALLURGICAL FACILITIES ENABLE US TO PRODUCE YOUR SPECIFICATIONS



Address Inquiries to:

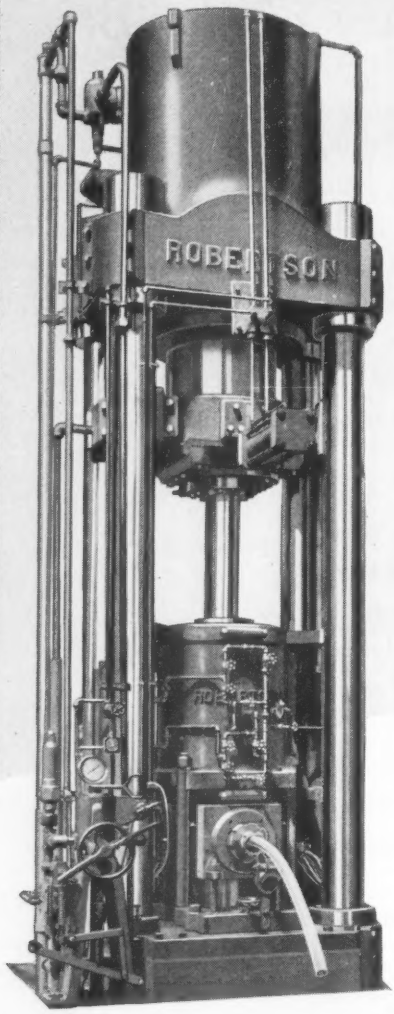
PORTSMOUTH STEEL CORPORATION

GENERAL OFFICES

PORTSMOUTH, OHIO

HOME OF THE FIRST ROLLING MILL IN NORTHWEST TERRITORY

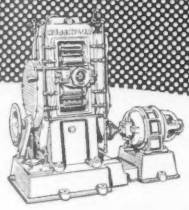
DOING ONE THING WELL FOR 89 YEARS



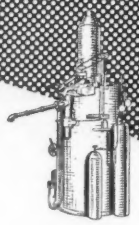
Cable Lead Encasing Press

For over 89 years, Robertson has specialized in the design and manufacture of *nothing but* high-pressure hydraulic equipment. A wealth of engineering experience and painstaking craftsmanship lie back of every piece of machinery produced. It follows, therefore, that a complete Robertson hose or cable lead encasing installation is engineered and "tailor-made" to accommodate the specific application for which it is intended.

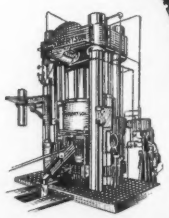
Doing one thing well for over four generations carries a tremendous advantage in any field. This advantage is yours when you consult Robertson about your high-pressure hydraulic equipment.



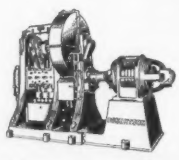
Lead Sheath Stripping Machine



Closed Lead Melting Pot



Hose Lead Encasing Press



High Pressure Hydraulic Pump

Robertson designs and builds all types of lead encasing machinery and hydraulic equipment including Extrusion Presses, Hydraulic Pumps, Metal Furnaces and Pots, Dies and Cores, Lead Sheath Stripping Machines and Special Equipment for Special Use.

If you have any problem involving the maintenance, conversion, installation or repair of your encasing equipment, consult our engineering department. They'll be glad to help.

JOHN Robertson COMPANY, INCORPORATED

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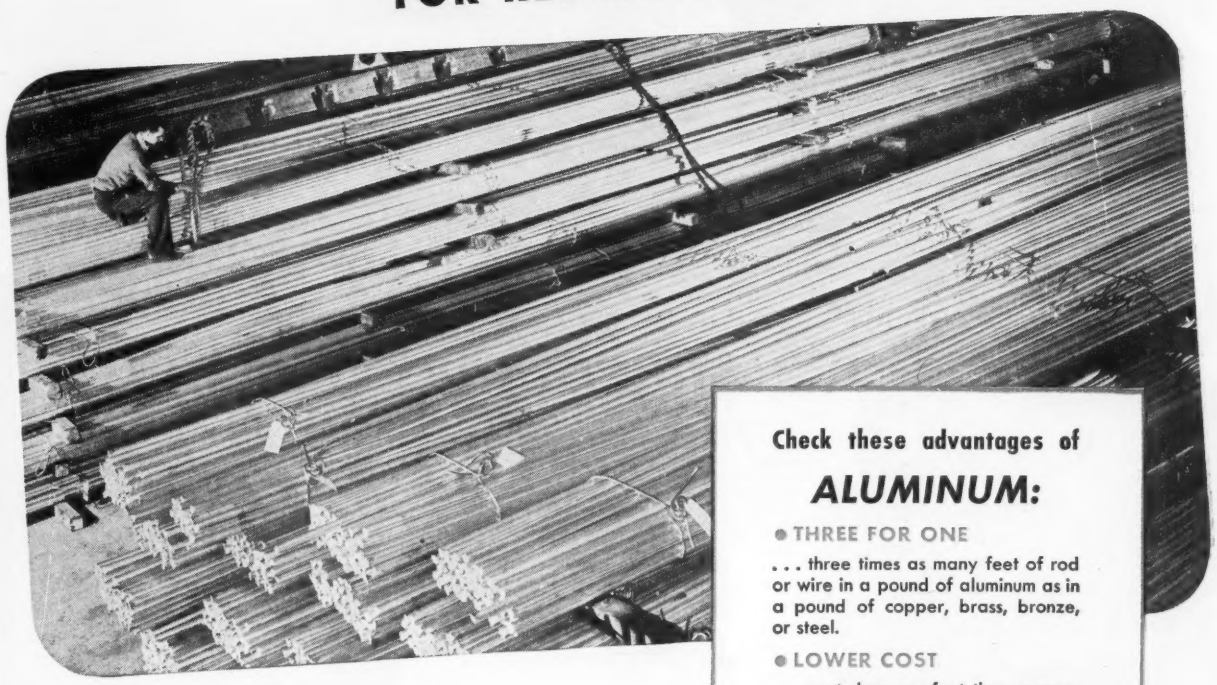
Designers and Builders of all Types of Lead Encasing Machinery

Since 1858

YOU CAN GET IT NOW!

ALCOA ALUMINUM ROD AND WIRE
FOR REDRAWING



Prompt shipment from Alcoa of aluminum rod and wire for redrawing! Available in all standard alloys.

Telephone your nearby Alcoa sales office today. ALUMINUM COMPANY OF AMERICA, 1828 Gulf Building, Pittsburgh 19, Pennsylvania. Sales offices in 55 leading cities.

Check these advantages of

ALUMINUM:

- **THREE FOR ONE**

. . . three times as many feet of rod or wire in a pound of aluminum as in a pound of copper, brass, bronze, or steel.

- **LOWER COST**

. . . costs less per foot than copper, brass, bronze, or stainless steel.

- **CORROSION RESISTANCE**

. . . aluminum cannot rust or stain. Needs no painting or protective coating.

- **EASY TO WORK**

. . . you can draw and fabricate aluminum on your present equipment.

- **ATTRACTIVE APPEARANCE**

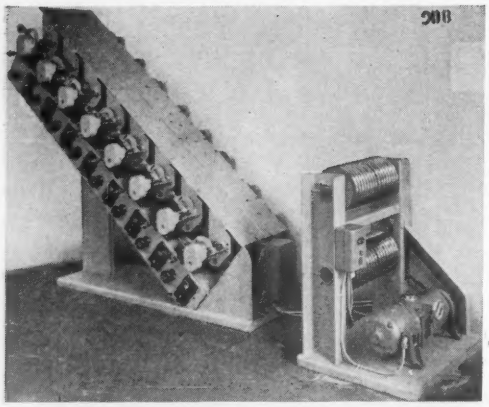
. . . for most finished products, use aluminum in its natural attractive color. Or give it any color of the rainbow by the patented Alumilite or Alrok processes.

MORE PEOPLE WANT MORE ALUMINUM FOR MORE USES THAN EVER

ALCOA

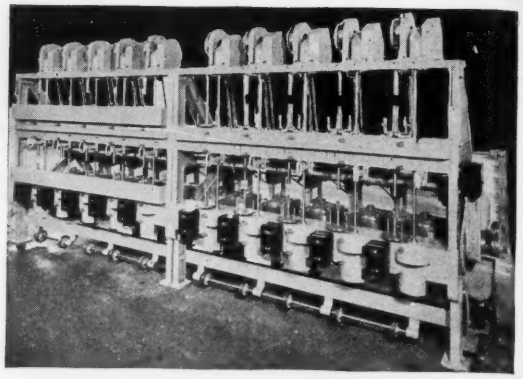
FIRST IN ALUMINUM

IN EVERY COMMERCIAL FORM



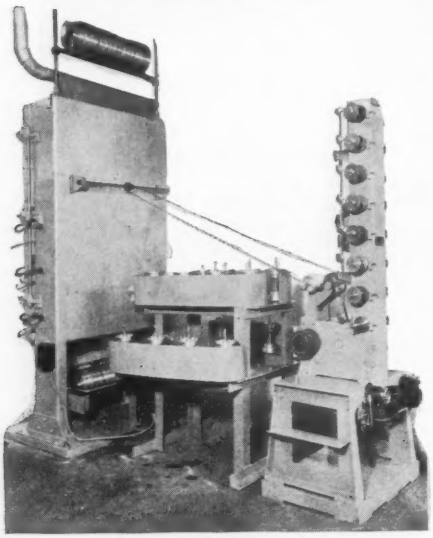
MULTIPLE WIRE PROCESSING TAKE-UP #908

16 units, for alloy, steel or copper wires.
Each take-up spindle is individually—
Ball-bearing Torque Motor powered, with wire tension controlled by rheostat. Layer wind individual unit traverses which are adjustable for rate and length of traverse.
All units collectively capstan controlled at adjustable constant speeds by ball-bearing speed reducer and variator.
Welded steel construction and ball-bearing thruout. Illustrating one of our new convenient models.



MODEL 2D10-MBB MACHINE #874

High speed, ball bearing, each unit individually motor driven for Application of all types of insulation spirally wound.



S-16 MEDIUM WIRE ENAMELING MACHINE #897

Ball-bearings and Motor Drive. Other models for heavier wires. Lacquering Outfits and Synthetic Applicators.

EST. 1855 AIMCO INC. 1915

"American" INSULATING MACHINERY COMPANY

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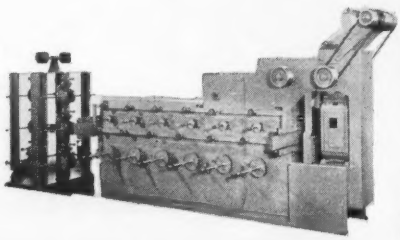
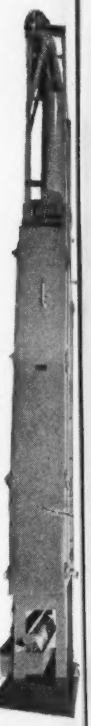
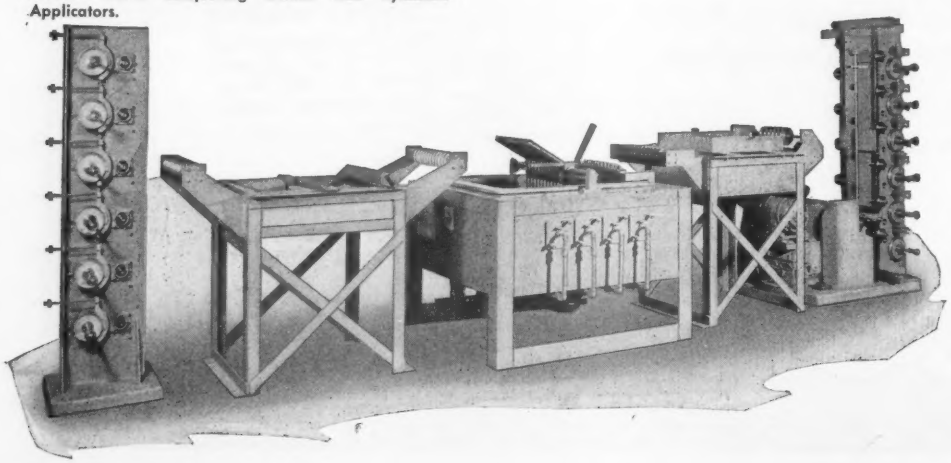
FULL LINE OF WIRE ENAMELING MACHINES



H-12 WIRE ENAMELING MACHINE #885

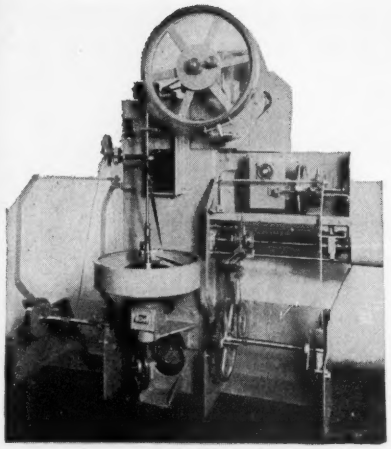
Electric Heated Oven (Single Sided) Take-up is Horizontal with Dual Spindles for large or small reels.





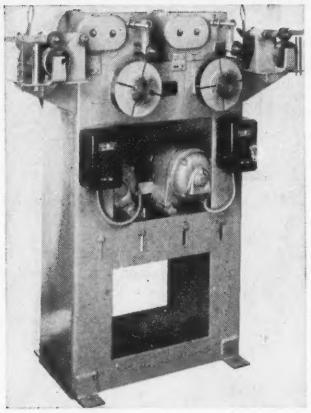
WIRE TINNING OUTFITS #894

Horizontal Takeups and Let-offs supplied for larger size wires and accommodating large reels.



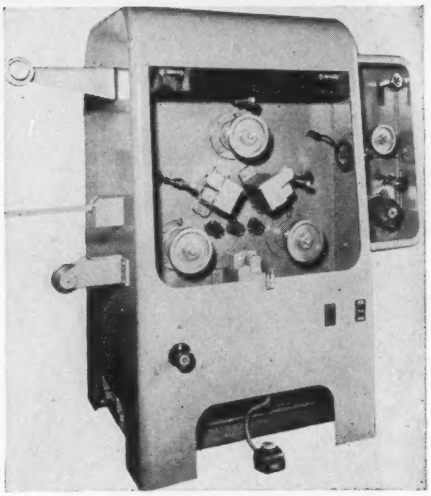
TAPING MACHINE #864

For Varnished Cambric and other tapes. Pads of tape are concentric mounted on dynamically balanced reversible head, arranged to give constant tape tension. Welded steel frame, ball-bearing mounted, adjustable traverse on take-up and motor drive.



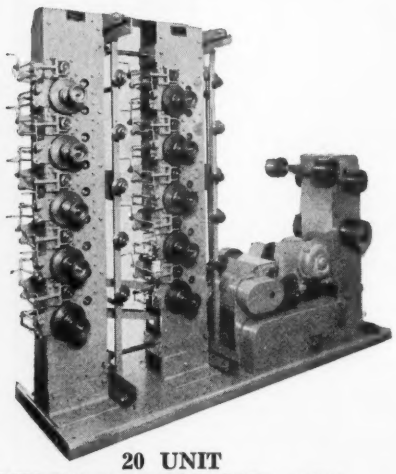
WIRE COILING MACHINES #901

Semi-automatic for producing coils of wire of predetermined measured lengths.
With your inquiry please state fully your requirements as to dimensions of coils, gauge and kind of wire.



HIGH SPEED WIRE DRAWING MACHINE #884

for Intermediate and Fine Wire



20 UNIT VERTICAL PULL-OUT #894

For tinning, annealing processes, etc., equipped with capstans, clutches for independent control of spool spindles and speed variator. Ball-bearing mounted and motor driven. Low height for ready accessibility.

EST. 1855 AIMCO INC. 1919

"American" AIM INSULATING MACHINERY COMPANY

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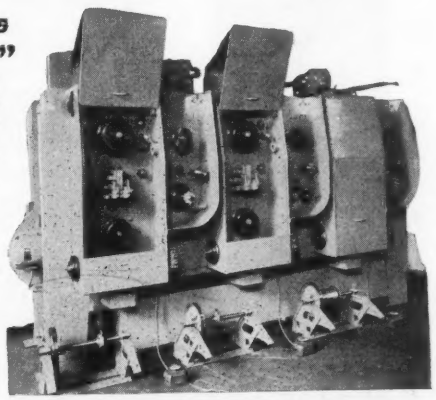
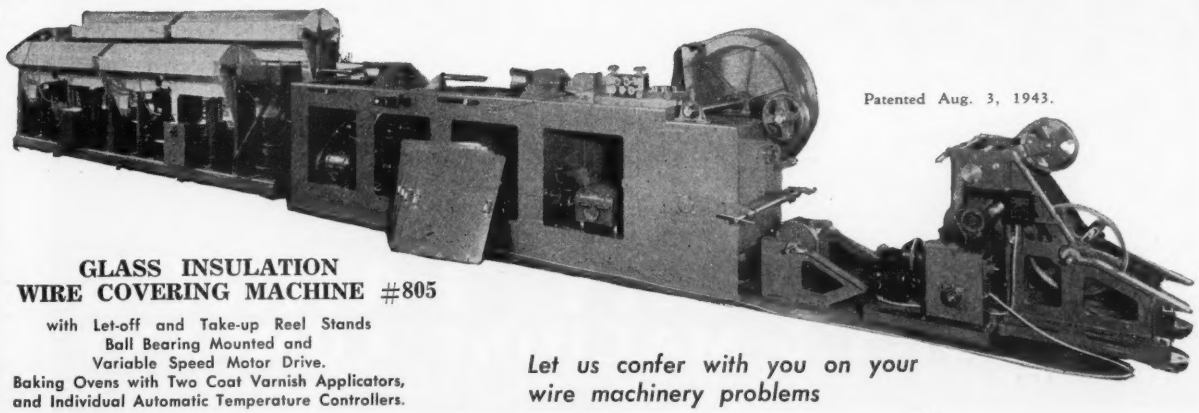
COMPLETE LINE OF WIRE INSULATION WINDING MACHINES



3 UNIT WIRE DRAWING MACHINE #895

With units individually motor driven, ball-bearing mounted, positive spool control on take-up. A combination of units to give versatility of product in fine and intermediate wires simultaneously.

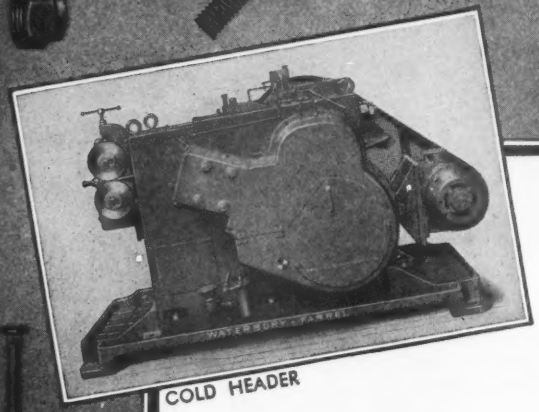


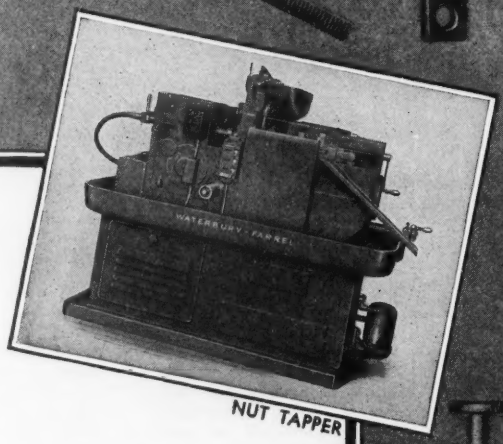
Patented Aug. 3, 1943.

GLASS INSULATION WIRE COVERING MACHINE #805

with Let-off and Take-up Reel Stands
Ball Bearing Mounted and
Variable Speed Motor Drive.
Baking Ovens with Two Coat Varnish Applicators,
and Individual Automatic Temperature Controllers.

Let us confer with you on your wire machinery problems

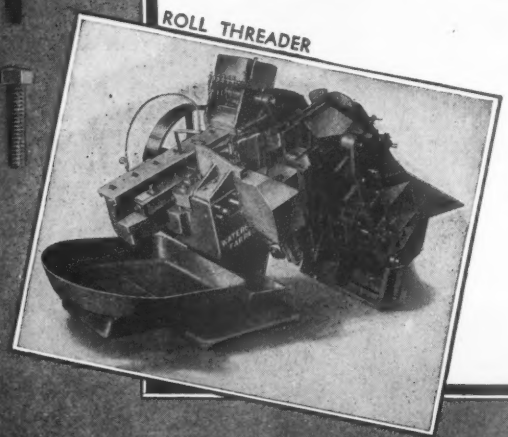

COLD HEADER

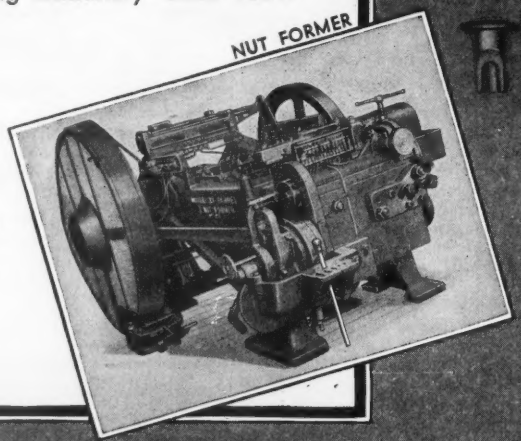

NUT TAPPER

THE VARIETY of bolts, screws, nuts and numerous other products of similar nature which can be produced from the coil, economically and to accurate size by the cold process, is almost limitless.

WATERBURY-FARREL, pioneer in this line of automatic machinery, is well-qualified by many years of experience to help solve your cold-heading problems and to furnish efficient machinery to meet your every need.

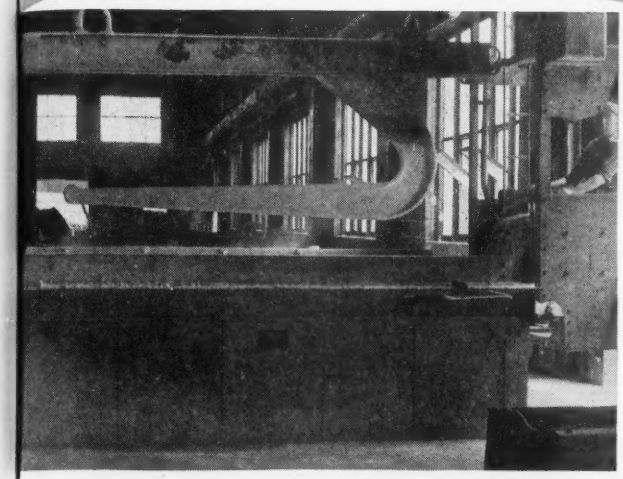
ALSO, Power Presses, Wire Drawing Machinery, Rolling Mills, and accessory metal-working machinery—since 1851.


ROLL THREADER


NUT FORMER

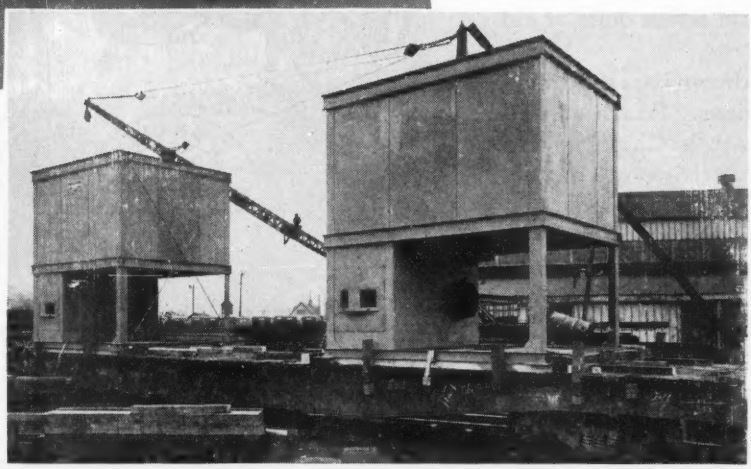
WATERBURY FARREL
FOUNDRY & MACHINE COMPANY
WATERBURY • CONNECTICUT • U•S•A

EVEN REASONS WHY You'll Profit by using the CARL-MAYER HI-SPEED REGISTERED ROD BAKER



Carl-Mayer Hi-Speed Rod Baker at Atlantic Wire Co.

Carl-Mayer Hi-Speed Rod Baker at Wickwire Spencer Steel Co.



Recent shipment of Carl-Mayer Hi-Speed Rod Bakers to large wire mill. Note compact heavy duty construction.

"CARL-MAYER" PATENTS
(Rod Baker)
United States
2,296,361
2,323,828
2,235,559
Canada:
396,144
401,589

NO OTHER BAKER CAN COMPARE!

- HI-SPEED PRODUCTION. Bakes up to 4,000 # of rod per pin in 3 to 15 minutes, depending on whether high or low carbon, or up to 1,000 # fine wire in 15 minutes.
  Compare this with your present practise.
- FUEL SAVING. Saves up to 40% over competitive designs due to patented self-opening and closing doors at top of baker and other features which greatly reduce heat loss.
- ELIMINATES RUSTING because of patented recirculating and blow-off system.
- SAVES SPACE. Production, as stated above, requires on the average of 150 square feet of floor space. *Compare this with the obsolete truck type baker you may be using.*
- LABOR SAVING (how essential). Crane operator handles all operations—cleaning, lime coat and bake. *Compare this with the old conventional truck type baker.*
- THE LARGEST WIRE MILLS have recently chosen Carl-Mayer Rod Bakers for the preceding reasons. Can you afford not to?
- INITIAL COST. Ask for quotation and see how reasonable the cost for the results obtained. Carl-Mayer Rod Bakers can be furnished with direct or indirect heating and for any desired fuel.

THE IMPORTANCE OF RECENT PURCHASERS *is Proof of* CARL-MAYER OUTSTANDING QUALIFICATIONS.

Typical Users Include:

- ★ American Steel & Wire Co. (2)
- Allegheny Ludlum Steel Corp.
- Atlantic Wire Co.
- Atlas Steel Co.
- Atlas Tack Corp.
- California Wire Cloth Corp.
- ★ Comfort Spring Co. (1)
- ★ Crucible Steel Co. of America (2)
- Eaton Manufacturing Co.
- Frost Steel & Wire Co., Ltd.
- Johnson & Nephew, Ltd.
- ★ Jones & Laughlin Steel Co. (4)
- Pittsburgh Tool Steel & Wire Co.
- ★ Republic Steel Corp. (3)
- Steel Co. of Canada
- ★ Wickwire Spencer Steel Div. of Colorado Fuel & Iron Corp.

★ *1947 INSTALLATIONS TO DATE*

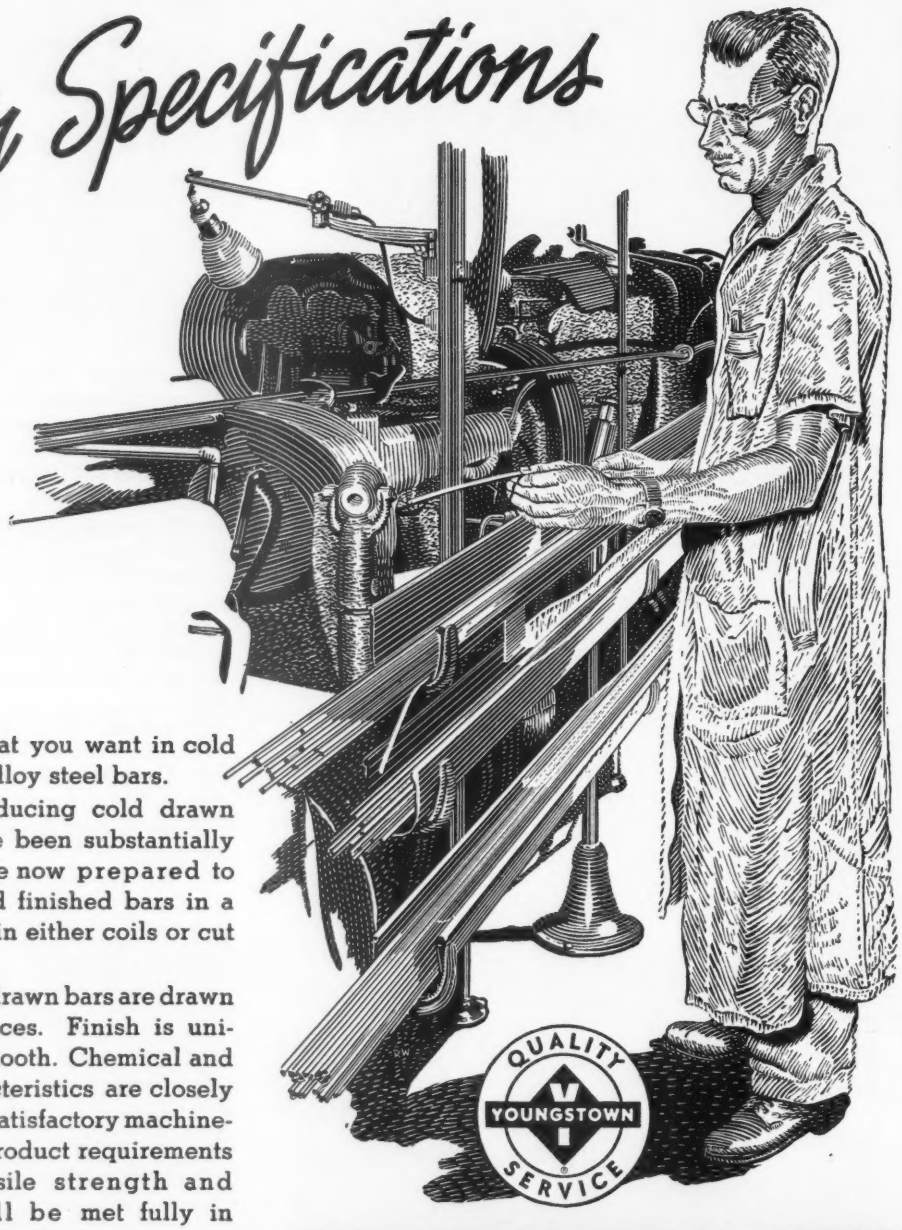
Backed by a Reliable Company with More Than 28 Years Experience

THE CARL-MAYER CORPORATION

3030 Euclid Avenue • Cleveland, Ohio

Cold finished carbon and alloy steel bars to meet

Your Specifications



TELL us what you want in cold finished carbon or alloy steel bars.

Facilities for producing cold drawn bars at our mill have been substantially expanded. We are now prepared to supply users of cold finished bars in a wide range of sizes, in either coils or cut lengths.

Youngstown cold drawn bars are drawn to precision tolerances. Finish is uniformly bright and smooth. Chemical and metallurgical characteristics are closely controlled to insure satisfactory machineability. Your own product requirements as to ductility, tensile strength and yield strength will be met fully in Youngstown cold drawn bars.

Get in touch immediately with the nearest Youngstown district sales office. Our representative will call on you promptly, to discuss your requirements and make every effort to serve you to your satisfaction.

YOUNGSTOWN

THE YOUNGSTOWN SHEET AND TUBE COMPANY

GENERAL OFFICES - YOUNGSTOWN 1, OHIO

Export Offices - 500 Fifth Avenue, New York City

Manufacturers of

CARBON - ALLOY AND YOLOY STEELS

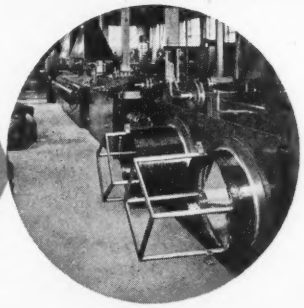
Cold Finished Carbon and Alloy Bars - Bars - Rods - Wire - Sheets - Plates - Pipe and Tubular Products - Conduit - Electrolytic Tin Plate - Coke Tin Plate - Tie Plates and Spikes.

THE *Trauwood* PROCESS IS SETTING A NEW "WIREBOUND" TRADITION!!

QUALITY, UNIFORMITY, LOW-COST OPERATION

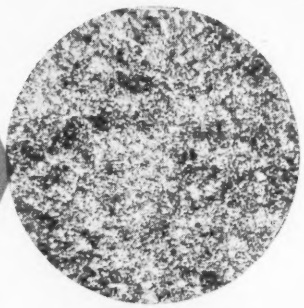
★ The electric resistance heating used in our process is over 90% efficient and results in a uniformly heat treated product plus the ability to duplicate exact heating and quenching cycles from day to day. Positive circulation in the molten metal quench bath insure absolute uniformity of the wire.

FASTER PRODUCTION FULLY AUTOMATIC



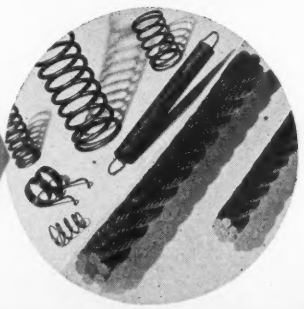
★ The TRAUWOOD process is much faster than ordinary furnace heating due to the very rapid rate of electric resistance heating. The equipment is entirely automatic and is easy to operate. Greater production with a material reduction in pickling and cleaning costs is insured.

BROAD THERMAL RANGE ACCURATE CONTROL



★ The finer grain produced by TRAUWOOD electric resistance heating develops the maximum physical and fatigue properties in any steel in either patenting, tempering or annealing. The annealing of stainless steel and other alloy wire and strip is readily accomplished since the high quenching temperatures necessary are easily and rapidly attained.

CAN BE DESIGNED FOR ALL SIZES AND TONNAGES



★ The TRAUWOOD process, in addition to doing a better wire heat treating job, is opening new fields of application for the wire industry. The equipment is designed to meet your specific requirements and can be built to handle all sizes in any tonnage required. Full information will be furnished on request.

Patented in U.S.A. and Foreign Countries

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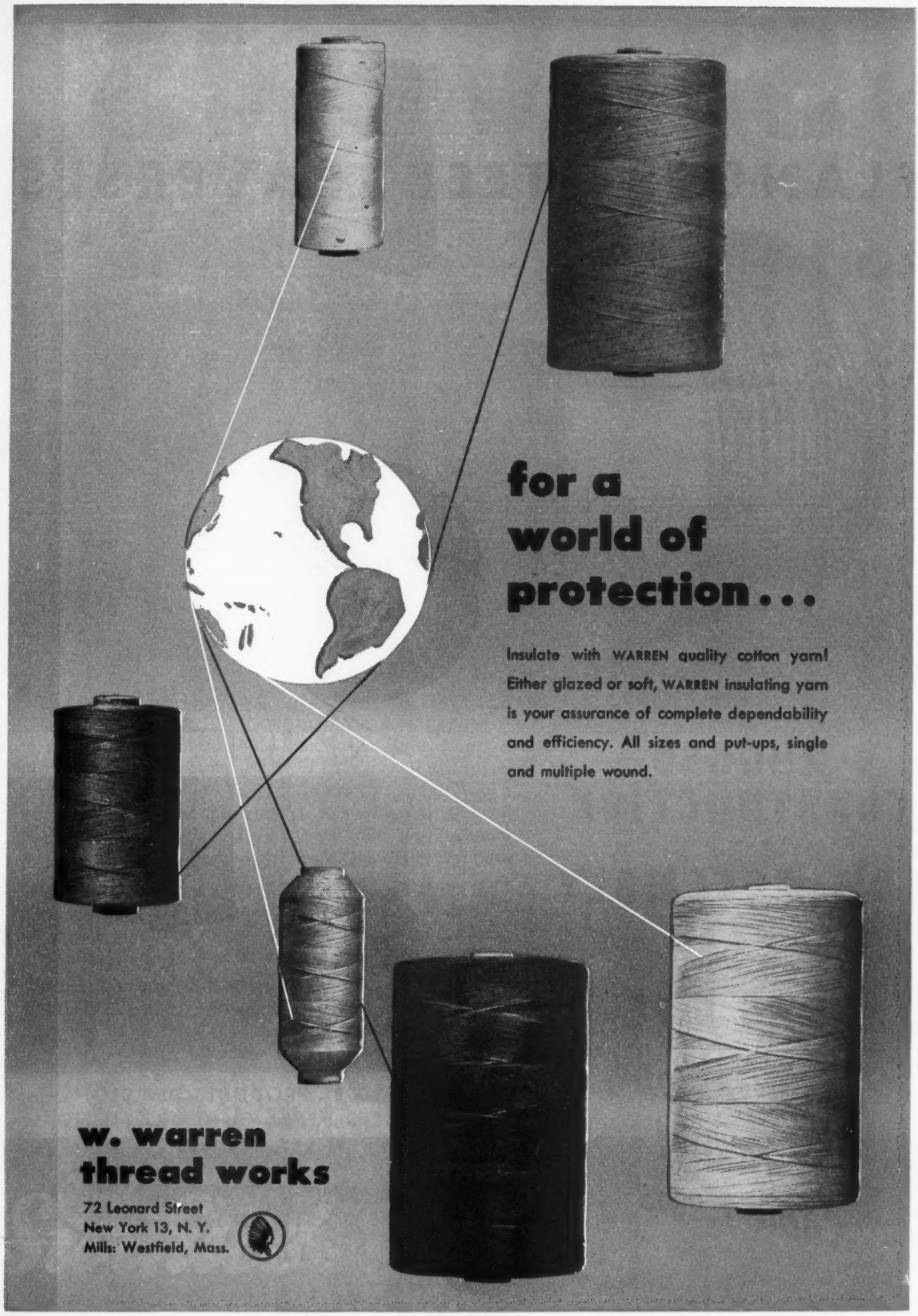
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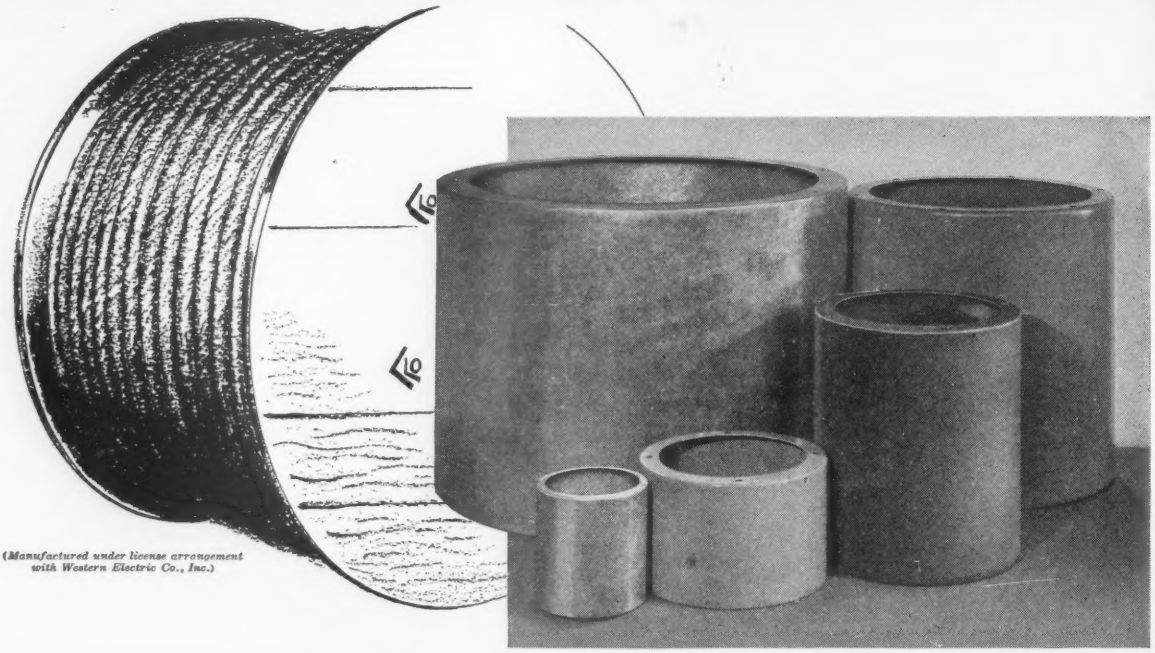

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MORGAN
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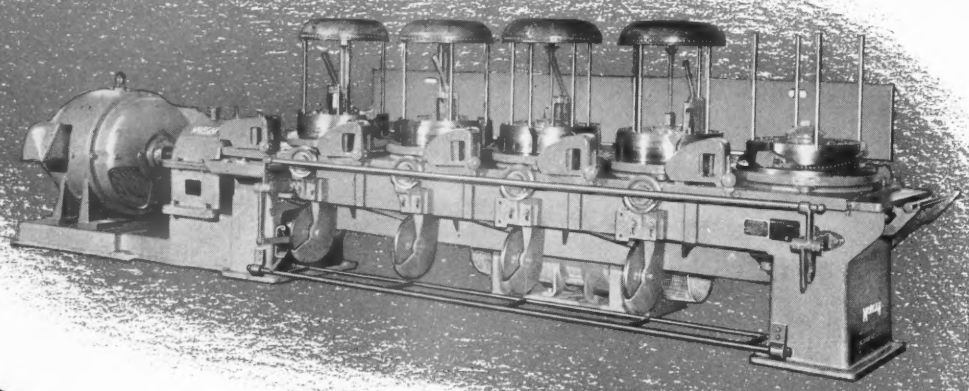

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WIRE MACHINES

MORGAN CONSTRUCTION CO.
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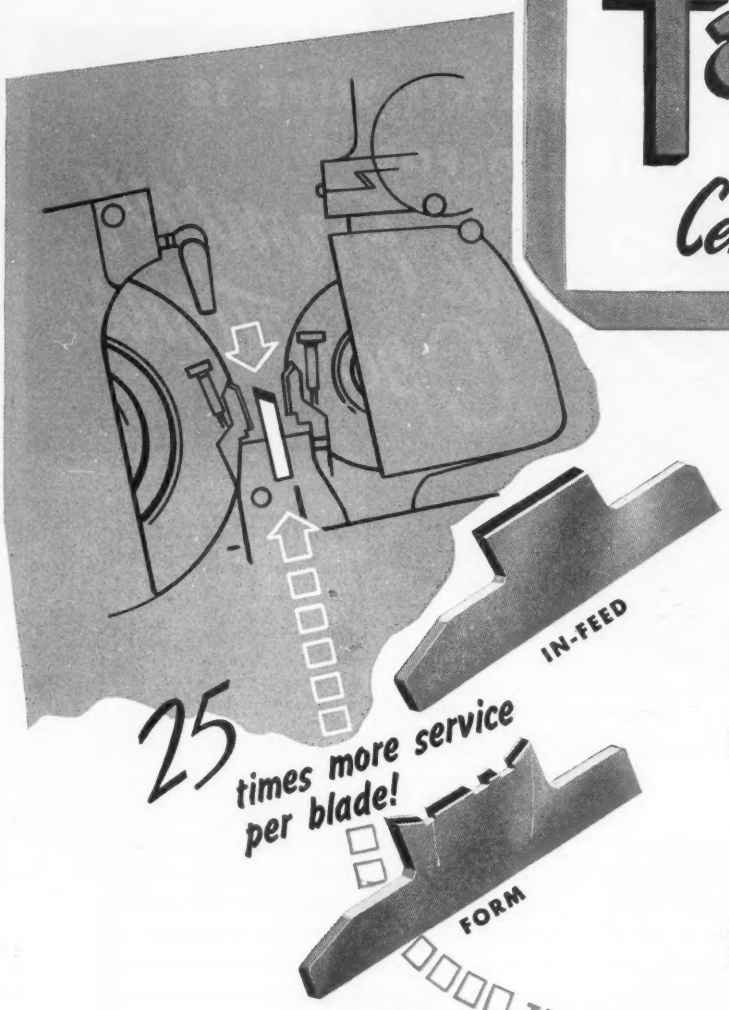
Talide
(TUNGSTEN CARBIDE)

Centerless Blades



ADVANTAGES

- Service life at least 25 times longer.
- One solid strip — no sections, lines, or seams to mark or score the work. (Only Metal Carbides makes Tungsten Carbide wear strips in one solid piece of any length.)
- Continuous operation reduces cost, scrap and down time.
- Blades available from stock.

STANDARD TALIDE BLADES SHIPPED FROM STOCK

We carry Talide centerless grinder blades and other standard Talide products at the following warehouses:

Newark, N. J., 166 Bloomfield Ave.

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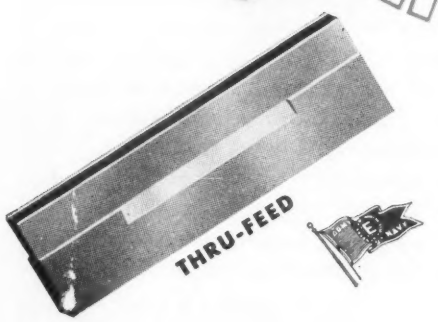
Chicago, Ill., 601 W. Milwaukee Ave.

(Sales engineers in Newark, Pittsburgh, Detroit, Indianapolis and Chicago.)

In addition to standard blades, we design and manufacture form or step blades for use in grinding parts with multiple diameters, steps, tapers, contours or other special shapes.

Forward part or drawing for estimate.



TALIDE METAL MEETS EVERY REQUIREMENT

A service life of 25 to 1 for Talide Blades over others is conservative. On most applications, these blades outwear cast iron, tool steel or hard-faced blades as much as 50 to 75 times.

Finished ground by diamond wheels, Talide work supports (made from hardest metal known) have exceptional surface quality and finish. To preserve this quality, we protect the Talide strip with a special plastic coating and pack each blade in an individual carton.

For the full production story, send for Talide Blade catalog 46-WP, complete with prices, sizes and specifications.

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Illustrations courtesy of Wire-O Corporation, Poughkeepsie, N. Y.

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It is no mere coincidence that Wissco Binding Wire is used in what is considered to be the smartest and the best of all mechanical bindings. For the wire used in Wire-O Binding is backed by Wickwire Spencer's 126 years of experience in making wire that meets exacting specifications.

Wissco Binding Wire is but one of many steel specialty wires made by Wickwire Spencer. If you have a difficult problem involving a new type of wire application our metallurgists are ready to cooperate in finding a solution. And whether you buy in moderate amounts or in carload lots, you will be assured of the same dependable service that has earned the confidence of our hundreds of old-time customers.

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Prepared by a Staff of Scientists under the Editorship of

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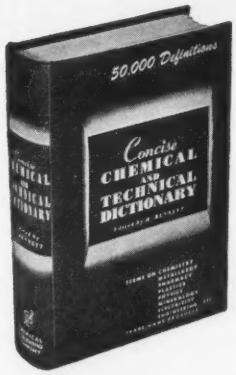

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Overall Lower Costs, due not only to elimination of liming and baking, but to cumulative effects of all the advantages of #267.

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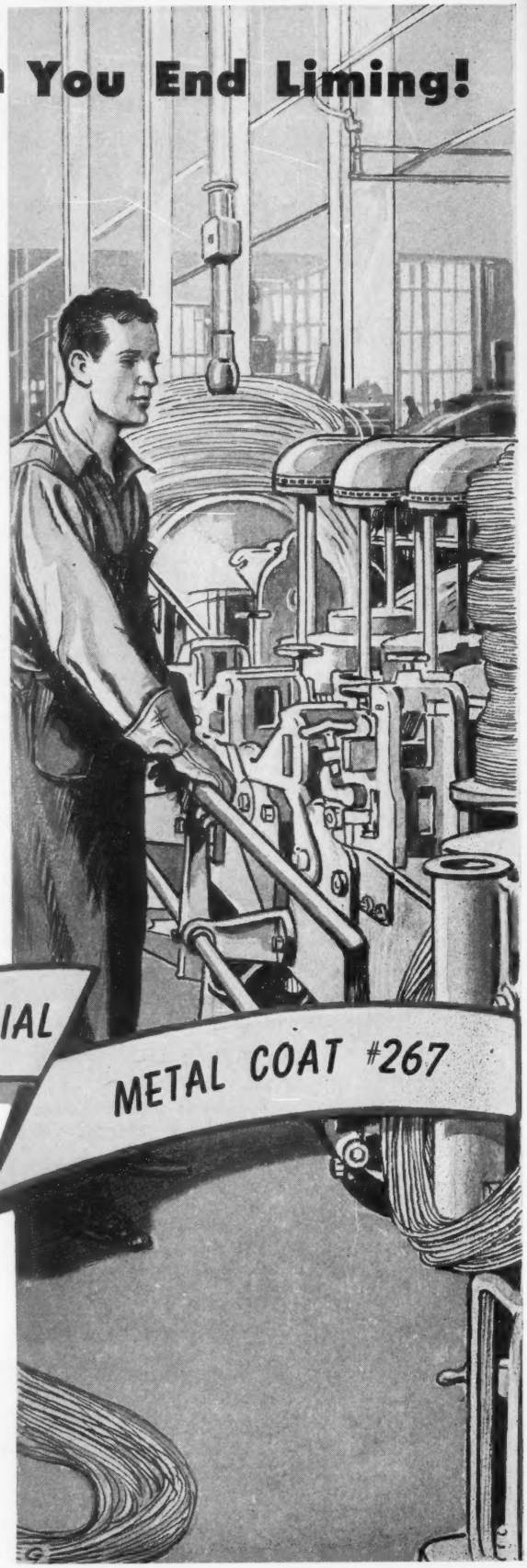

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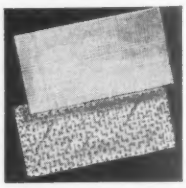
CABLE TAPE

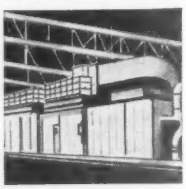
QUESTION NO. 1: How does sizing affect a cable tape's insulating qualities?



ANSWER

It affects it greatly. Too much sizing means less varnish impregnation—and it is the varnish that insulates, not the sizing. The cloth used in G-E cable tape contains just the right amount of sizing to permit maximum varnish impregnation.

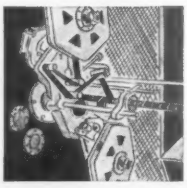
QUESTION NO. 2: What advantages are there in pre-testing cable tape?



ANSWER

Pre-testing brings to light any flaws in the cloth itself. Mechanical and dielectric strength can be accurately determined before the tape is used, and resistance to chemicals and moisture can be established to help guarantee long and efficient service life. Each lot of G-E tape is carefully pre-tested to make certain that it has all the important insulating values.

QUESTION NO. 3: How does a tape affect your cable business?



ANSWER

Naturally a good tape helps insure a high quality cable. G-E cable tape more than meets I. P. C. E. A. standards. It is extremely easy to apply because it is soft, pliable, and of uniform width and thickness.

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WP-10

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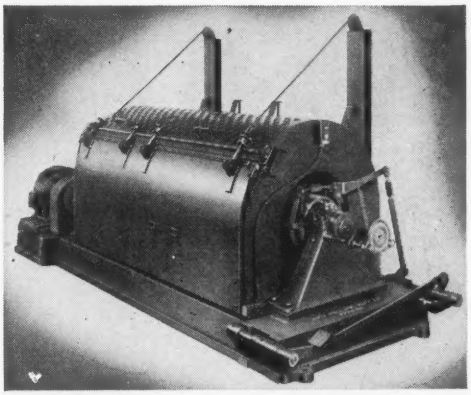

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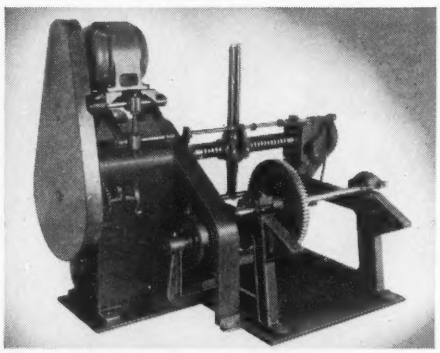

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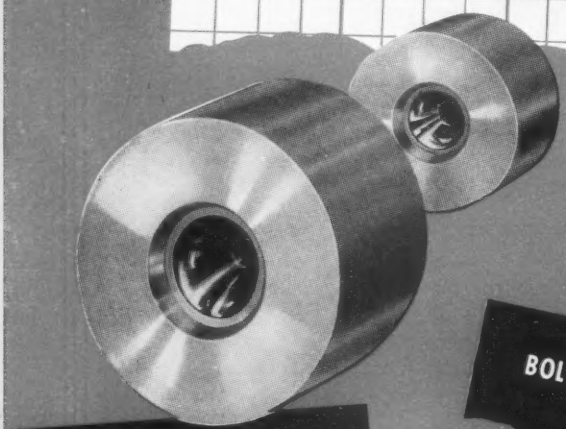
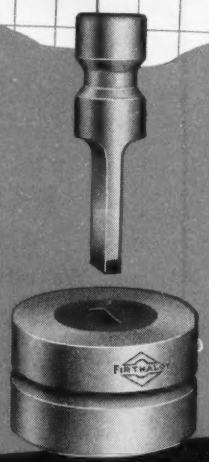


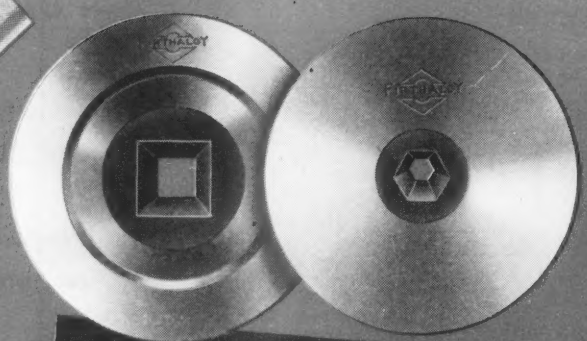
WIRE INDUSTRY

BOLT, NUT & RIVET INDUSTRY



POWDERED METAL INDUSTRY

TUBING INDUSTRY



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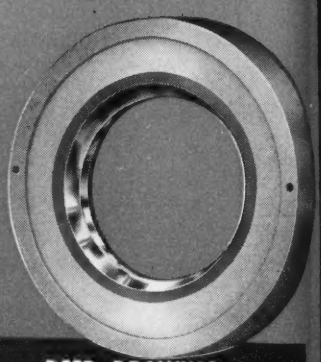

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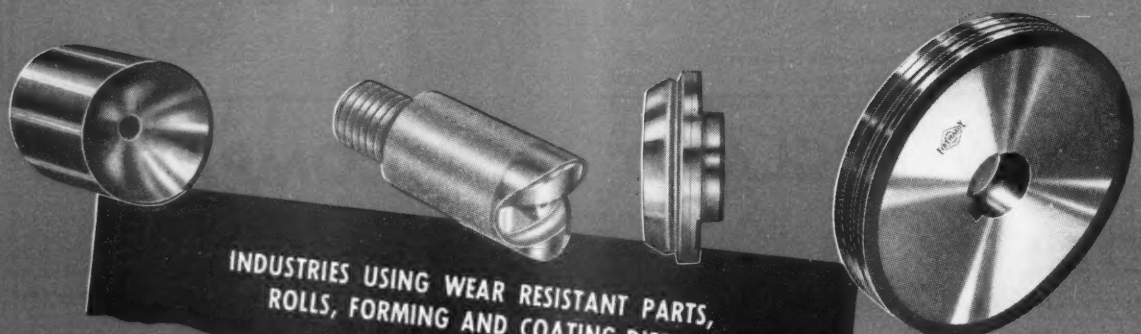

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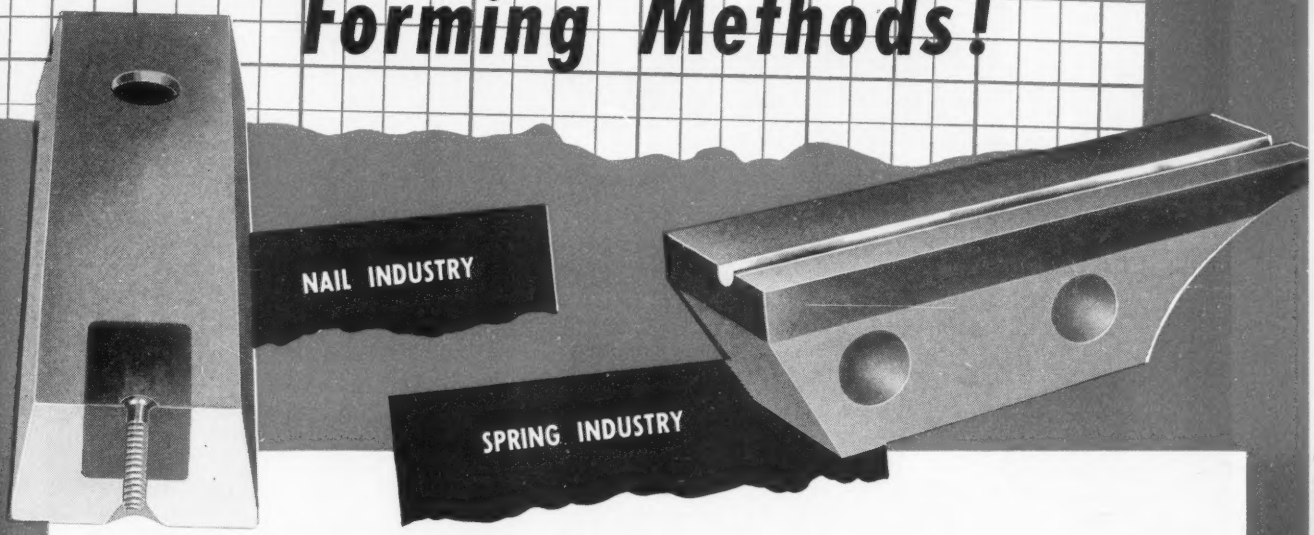

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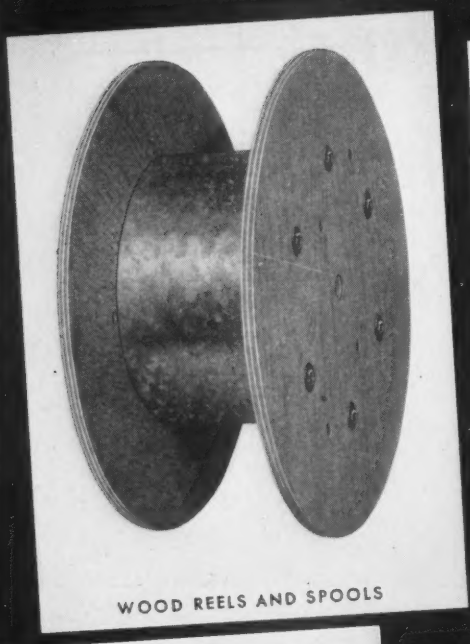

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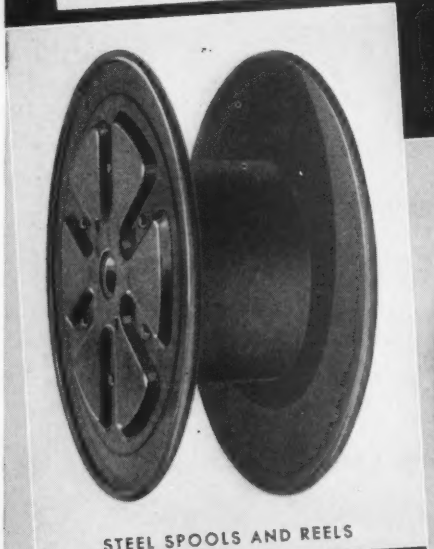
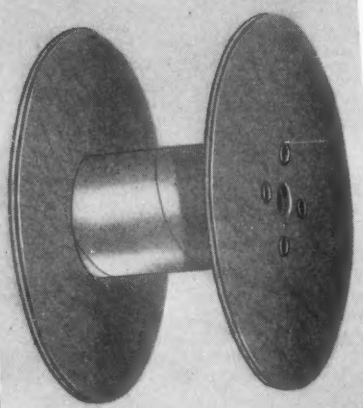


STEEL SPOOLS AND REELS

LIGHT WEIGHT REELS



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Greetings and Welcome

to the

Wire Association Convention!

This year, 1947, marks the 18th annual convention of the Wire Association. You gentlemen of the wire industry, which includes the manufacturers of machinery, equipment and supplies, make a gathering of this kind successful by your attendance and enthusiastic participation in its affairs. The convention is planned for you. So this year again we welcome you to what we believe to be the finest and most constructive program ever for your enlightenment, entertainment and benefit.

Do not miss the technical papers and discussions. There's meat in them to take home and use. Nothing dry or impersonal in our technical sessions. Go on the plant inspection trips, attend the Annual Wire Association Luncheon and the famed Stag Smoker Dinner.

Ample opportunity is given those who attend the Convention to meet with others and exchange ideas on the many technical problems that do not lend themselves to discussion in the technical sessions, although we hope you will participate in those and ask questions on which you would like answers.

If you have not made your hotel reservations and plans to come, even at this late date we urge immediate action. We want everybody to be there. See details regarding the time and place elsewhere in this issue.

THE WIRE ASSOCIATION

Richard E. Brown, Executive Secretary

300 Main Street Stamford, Conn.

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The Wire Outlook

Once each year wire men foregather from every corner of the country to give and take on the many problems in wire and wire product manufacture that have arisen during the preceeding period.

The 1947 Convention will partake of an international note more than ever, now that the war's turmoil has ceased and our good neighbors from across the seas are settling down to the re-establishment of their wire producing units.

Canada, whose friendly proximity to us relates her strongly to our own well-being, is always well-represented. This year, however, will provide the members of the Wire Association with an opportunity to welcome a number of guests from widely scattered parts of the earth. This country and world-wide interest in Convention affairs in Chicago is significant of a broadening will to cooperate for the general good of our industry. The opportunity afforded for men to become better acquainted has far-reaching implications of understanding and progress. All members and guests are cordially welcomed to this Eighteenth Annual Convention of the Wire Association.

A general cut-back in foreign trade is in prospect, which at the moment, will benefit many domestic consumers of wire due to our own shortages.

In the East a slackening in orders is noted, particularly in specialty lines. Some mills have caught up with the demand for rope, spring, razor blade and music wire, while galvanized and high carbon specialties are scheduled through to the end of the year. Screw manufacturers are pressing for additional tonnage.

In the Midwest merchant items are in so great demand as to make the shortage acute. Nails, bale ties and fencing are short and inventories low. A dearth of rods continues to plague the non-integrated mills. Manufacturers wire is tight and will remain so until rods become more plentiful. The effects of the hot weather, floods and strikes during the summer are now being felt.

Manufacturers of bolts and nuts report a small decline in their backlogs, although in the smaller sizes the demand is greater than ever. Contributing to this is the difficulty experienced on the part of bolt and nut makers in getting steel wire of the right sizes for fabrication.

More copper could be used by electric wire plants and maximum production is still something to be anticipated. Brass mills, on the other hand, are not able to absorb all the copper that is available to them. The veto of the subsidy bill is not expected to have any material effect on copper supply.

Lead and zinc are now held to be in approximate balance with supply.

It may be said that while our complex economy moves slowly toward adjustment, things are so much better than they were a year ago, we are justified in feeling that we are well along the road to normal operating conditions.

—from the Editor's Desk

UPRIGHT ★ ★ ★

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THESE high speed machines are available in several sizes and can be had with either a coiling block or spooler. The spooler may be an attachment or a separate floor-type device, such as shown. This is the No. 4 machine with belt-type cradle spooler. It is driven by a direct-coupled motor (not shown), has 13 dies and capacity for drawing copper from ¼″ maximum starting size down to a finishing size of from No. 10 to No. 18 B. & S. gage. The dies and the hardened steel drawing rolls are enclosed by a rolling steel curtain to confine the splash of the drawing lubricant.

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WIRE AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip, Wire and Rod Products and Insulated Wire and Cable.

DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 22 OCTOBER 1947 No. 10

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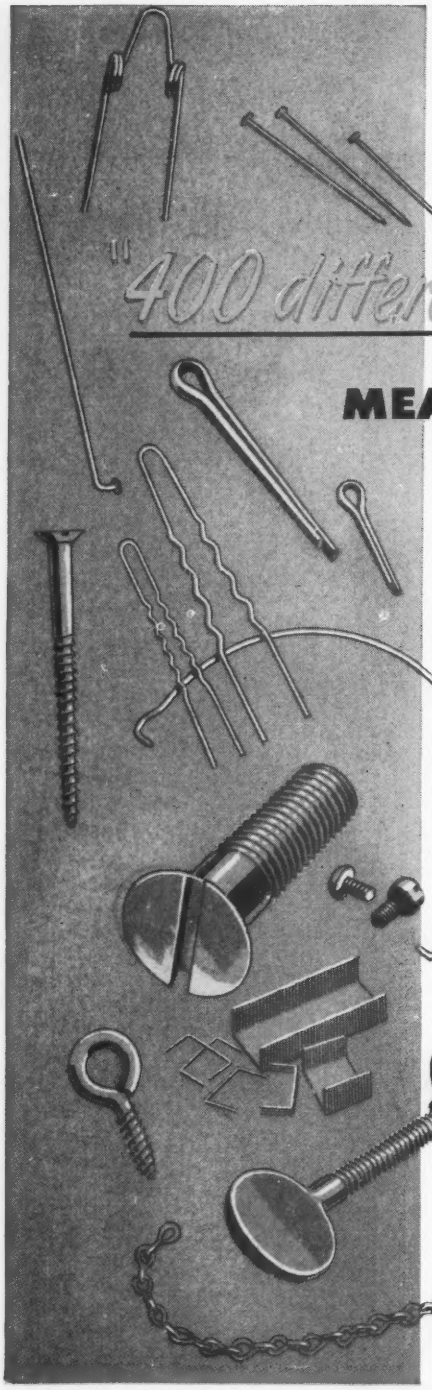

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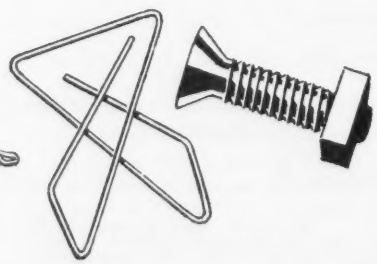

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WIRE
AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip.
DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 22 OCTOBER, 1947 No. 10

Electric Salt Baths for Wire Processing

by H. J. Babcock, Research Engineer
Ajax Electric Company, Inc.
Philadelphia, Pennsylvania

Some developments and improvements made in the Wire Industry during the past ten years. Presented at the Wire Association Convention in Chicago in October 1947.

AS a means of heating both steel and non-ferrous alloys the electrode type salt bath is steadily widening its field of usefulness. In the manufacture of wire and wire products the heat treatment of the metal in process is one of the most important operations. Whether the treatment is a process anneal for the removal of stress, or a full anneal to increase ductility by softening, or patenting to enhance the physical properties, the method employed and the equipment used for heating have a resultant influence on cost. The efficient functioning of the heat treating department with its relative effect upon subsequent operations will be reflected in the uniformity of the product in terms of metallurgical and physical properties as well as the surface condition of the metal which so largely influences die life, per cent reduction permissible, metal loss in pickling and ultimately tonnage output.

* * *

TODAY, with the marked increase in the number of installations of molten salt baths in many of the leading wire mills of this Country, it has become evident that heat treatment of wire by immersion in liquid baths extends certain operational advantages worthy of careful consideration.

* * *

THE inherent advantages of heating in a bath composed of molten salt have long been recognized. But, liquid baths designed to be heated externally possess certain short-comings. The short operating life of metallic pots or of metal walls through which heat is applied, thermal lag in heat input under heavy production conditions, etc., limited the practical use of the salt bath.

* * *

THE development of the immersed-electrode principle, with the heat produced directly in the molten salt by flow of electric current, not only eliminated the objectionable features of externally heated baths, but made available in practical form the advantages inherent in the use of molten baths.

* * *

SINCE these advantages are reflected so directly in the results of heat treatment in molten salt they are summarized, briefly, below.

* * *

1. TOTAL elimination of all atmosphere.

The surface of the metal is "sealed" from contact with air thus avoiding the usual problem of controlling scale, pitting and decarburization. No auxiliary equipment need be provided for gaseous protective atmospheres, nor skilled technical operators to operate it. This simplification lowers the initial cost of salt baths.

* * *

2. UNIFORM heating.

The hot liquid salt flows instantly into contact with all parts of the charge immersed in it. It supplies heat by intimate wetting of the total surface of the metal. Thus, heating only by conduction, the entire charge is brought to a uniform temperature.

* * *

3. RAPID heating-up time.

Molten salt will deliver heat directly to the metal in all parts of the charge at a rate that depends only on the conductivity

of the work itself. An electrode type bath will heat a charge of metal in one quarter to one sixth the time required in radiant furnaces. Consequently, for equal tonnage output, a much smaller floor space is used than with externally heated equipment.

* * *

4. MINIMUM lag and no "overshoot" in temperature control.

Internal heating by flow of electric current between closely spaced, immersed electrodes, constantly propels, by electrodynamic action, freshly heated salt into the work zone. Temperature is controlled within plus or minus five degrees F. at all points in this zone.

* * *

5. NO furnace temperature gradient.

Heat is transmitted to the charge only by contact with molten salt. The temperature at which this fluid heating medium is maintained is the highest to which any part of the charge is exposed. The high gradients of radiant heat sources are eliminated. Optimum metallurgical control of structures and uniformity of physical properties in all parts of the charge are thus assured.

* * *

6. LOWER capital investment.

Elimination of auxiliary equipment, shorter heating cycles providing high output of work from relatively small bath volume combined with closer control over quality of product reduce the investment required per ton of wire.

* * *

IN order to relate the significance of such advantageous features to the heating processes used in the manufacture of wire, let us briefly recall the fundamentals of the procedures involved. The principal heat treatments in the wire mill are — (1) Annealing; (2) Spheroidizing; and (3) Patenting.

* * *

THE purpose of these treatments, familiar though they may be, is briefly outlined below, accompanied by a note pertinent to one or more of the above features of salt bath treating.

* * *

1. **THE Process or Work Anneal** is to remove the effects of hardening due to cold work in wire drawing or cold rolling, thus making the metal ductile and soft.

* * *

IT consists of heating an iron base alloy to a temperature just below the lower limits of the critical temperature range. After being heated to the required temperature the metal may be cooled at any desired rate, even in water, to complete the operation.

NOTE: The essence of the operation is time. Also, uniformity of temperature, absence of furnace gradient, elimination of the effect of atmosphere, combine with a 15 to 30-minute heating cycle in molten salt to offer attractive economic advantages.

* * *

2. **THE Full Anneal,** applied principally to refine the grain of the metal, consists traditionally of heating the iron base alloy to a temperature about 100 Deg. F. above the upper limit of the critical temperature range, holding for a period of time consistent with the solution rate of the components of the alloy, followed by slow cooling to below that range. In general, the slower the cooling, particularly through the critical range, the softer the steel.

* * *

DURING the last decade, the work of Peter Payson and other metallurgical investigators, made available data on the Time-Temperature — Transformation characteristics of austenitized carbon and carbon-alloy steels. They have shown that it is feasible to anneal steel by transformation at constant subcritical temperature with relative rapidity instead of by the traditional slow cooling procedure.

* * *

CYCLIC annealing, as this procedure is called, consists of heating the metal to a temperature above the upper limits of the critical temperature range followed by transfer to a salt bath quench furnace. In this quench furnace, maintained at suitable temperature below the lower limits of the critical temperature range, subsequent transformation of the austenite occurs, forming a structure identified with the temperature of the isothermal quench.

* * *

DEPENDING on the transformation characteristics of the steel, the mass of the steel being handled and the furnace in which the steel is being annealed, the cyclic anneal can accomplish, often in fractions of an hour, what would require more than half a day by the traditional, slow-cool method of annealing.

* * *

WHEN applying this treatment, the required information on most steels is available in the form of TTT curves of which Figure 1 and Figure 2 for SAE 2340 and SAE 52100 are typical. Such curves supply the operator with a guide to the optimum austenitizing and subcritical temperature required, as well as the time for the transformation to go to completion. Often a great economy in time will be indicated. The procedure has been explained in detail in numerous technical articles.

NOTE: The important factor is uniformity of temperature and, above all, cooling power of the salt bath quench furnace and the control of temperature in this isothermal quench. A little later in this article data will be presented on the remarkable cooling power of molten salt, particularly at high temperatures and low temperature differentials.

* * *

SINCE conventional furnace annealing requires exceedingly slow cooling rates, it would be necessary, for example, in order to secure a yield of two tons per hour of annealed rod to supply furnaces and cooling arrangements of relatively large size occupying extensive floor space, it being assumed that a total annealing cycle of 30 hours is required. This production could be obtained in comparatively small salt baths utilizing the cyclic annealing process, which calls for a total time cycle rang-

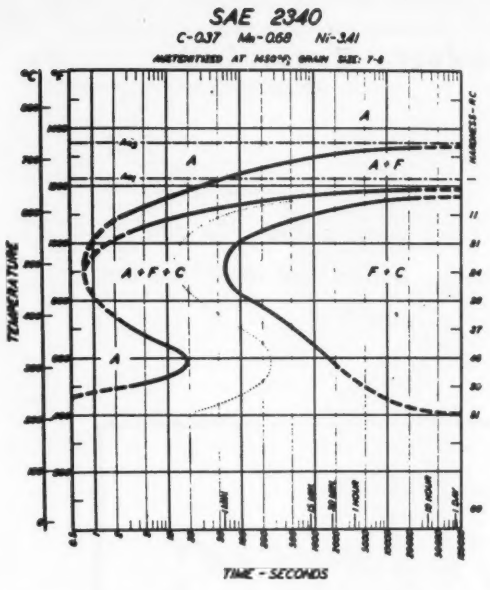

Fig. 1—For cyclic annealing of SAE 2340 nickel steel, a hardness of about Rockwell C 11 may be obtained by holding for about 10 to 15 minutes in the subcritical transformation bath. ★ ★ ★ ★

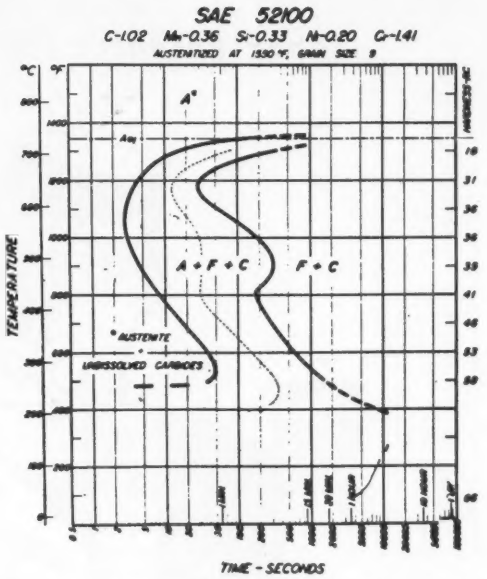

Fig. 2—SAE 52100 chrome-high carbon steel austenitized at 1550 Deg. F. yields hardness of Rockwell C 18 by holding for about 10 to 15 minutes in the subcriitcal transformation bath at about 1320 Deg. F.

ing from 30 minutes to rarely more than two hours.

★ ★ ★

3. **SPHEROIDIZING** is defined in the "Metals Handbook" as "any process of heating and cooling steel that produces a rounded or globular form of carbide".

★ ★ ★

THE production of spheroidal structures depends primarily on the austenitizing temperature, according to recognized authorities. Either in conventional annealing or cyclic annealing, it is stated, spheroidization is promoted by low austentizing temperatures, i.e., not in excess of 20 to 50 Deg. F. above the critical.

★ ★ ★

VARIOUS procedures for spheroidizing, dictated by metal analysis and type of product, are employed such as: reheating to a temperature just under the lower critical; austenitizing not over 50 Deg. F. above the critical temperature range and quenching just under the lower limit of the critical range; or, alternately heating just above the critical temperature and cooling to a temperature just below the critical range and then repeating this cycle for the duration of the treatment. In all cases spheroidizing is promoted if close control of temperature to which the charge is exposed is obtainable.

NOTE: The uniformity of temperature produced throughout the work during practically the whole heating cycle in the salt bath, combined with absence of temperature gradient, and temperature control within plus or minus 5 Deg. F. make available the means to reduce spheroidizing time to a minimum.

★ ★ ★

4. **PATENTING** is a procedure consisting of heating iron-base alloys above the critical temperature range, followed by cooling at a controllable rate below that range. This quench is carried out in air or, more commonly, in molten lead or a mixture of molten nitrates or nitrites maintained at temperatures usually between 750 and 1050 Deg. F., depending on the carbon content of the steel and the properties required in the finished product. This treatment is applied in the wire industry to medium or high-carbon steel to produce a sorbitic structure preceeding further wire drawing or processing.

NOTE: The quenching method, in terms of cooling power and accurate maintenance of bath temperature is the key to this operation. This is requisite to high quality, uniform products. Salt bath quenching in wire patenting operations will be discussed later.

★ ★ ★

THERE are available today various types of salt baths and salt mixtures that are finding application in increasing numbers to these heat treating procedures of the wire mill. The range of temperature required for the anneal of a given type of steel — as well as the kind of treatment, i.e., work anneal, full anneal, etc. — dictates the nature of the salt and the type of construction of the salt bath to be used.

★ ★ ★

IN the Work or Process Anneal of carbon or low alloy carbon steels, a salt bath constructed with a welded steel plate pot, nested in a heat-insulated casing is used, heated within the range of 1250 to 1325 Deg. F. by closely-spaced pairs of electrodes immersed directly in the salt.

★ ★ ★

THE principle features of construction and arrangement of electric power circuits in such salt baths is shown diagramatically in Figure number 4. One or more pairs of electrodes (as bath size and load capacity require) are immersed in the salt, which being melted, is an electrical conductor. Each electrode pair is connected to a step-down transformer. These electrodes, with only a small gap of one to three inches, across which

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Greetings

AND A

HEARTY WELCOME, WIREMEN

18th ANNUAL CONVENTION - WIRE ASSOCIATION
LASALLE HOTEL, CHICAGO, ILL.
October, 20-23, 1947 (Inclusive)

Whether you are friends or acquaintances, customers or competitors, we welcome you sincerely and invite you to spend some time with us. Our aim is to make your convention more worthwhile.

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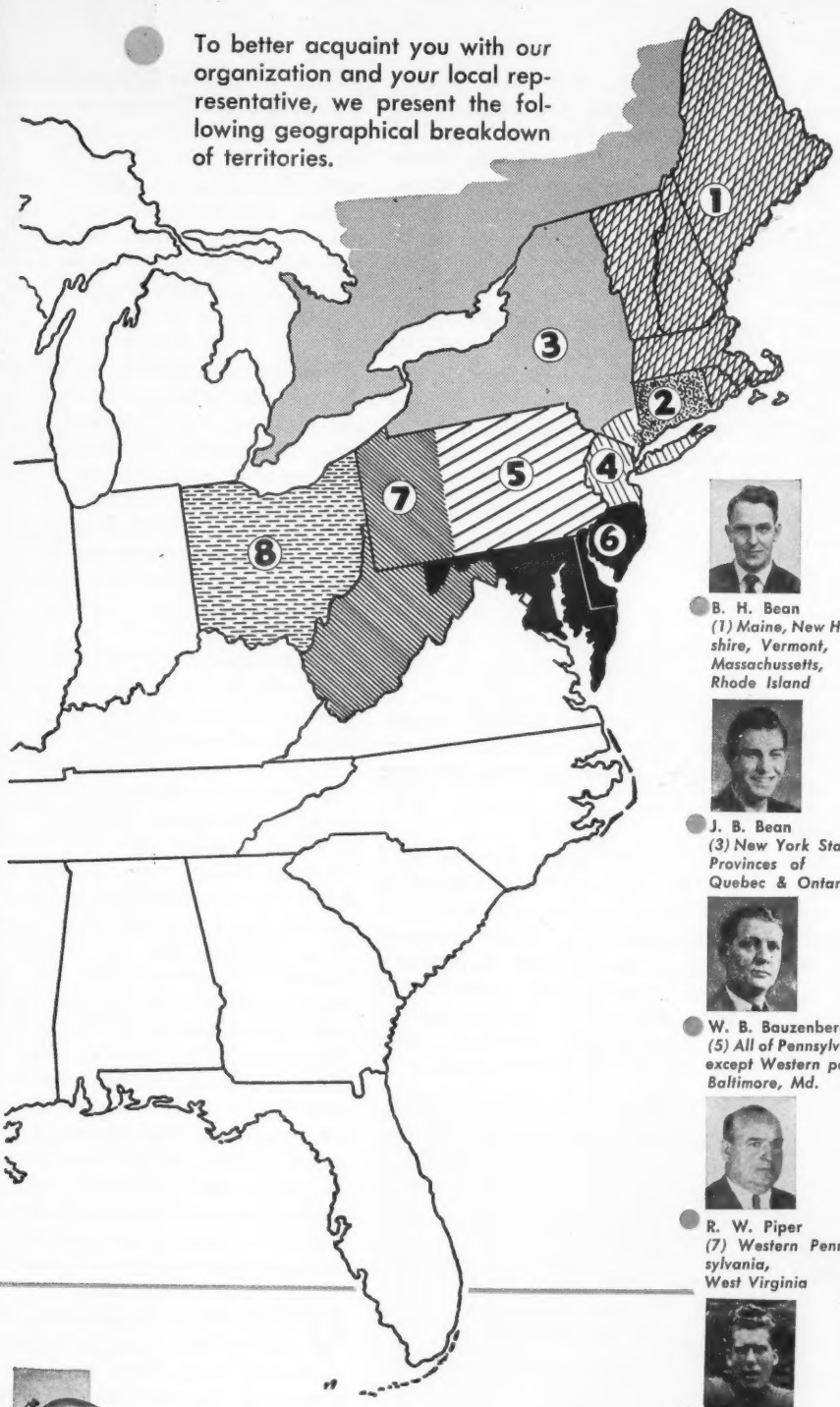
To better acquaint you with *our* organization and *your* local representative, we present the following geographical breakdown of territories.



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current flows, require only five to twenty-five volts for full power input.

* * *

THE pairs of electrodes are arranged in close proximity along one side of the bath, usually, but where wide baths and heavy loads require, also on opposite sides. However, at all times, the design of the electric circuits is so arranged that the working space is kept distinct from the heating zone. The result is that freshly heated salt is constantly propelled, not by mere convective thermal flow, but by powerful electrodynamic propulsion from each electrode pair in the heating zone into the work zone of the bath. Thus the work is heated in a constant flow of molten salt, held to a temperature deviation of less than 10 Deg. F.

* * *

THIS design provides an internally heated bath which is instant in its response to demands for heat. Since immersed electrodes cause current to flow directly through the salt between them, the heat thus produced is supplied to the molten bath without the thermal lag that lowers the productive capacity of molten baths heated by external means. Also, the sole source of heat is that generated in the salt confined between each pair of electrodes (a volume of salt about 2″ by 2″ by the depth of immersion of the electrodes). The input of heat ceases the instant current stops flowing. Thus, when the electrical controls cut off the power, there is no further rise in temperature, i.e., there is no over-shoot, as is the case with equipment heated by external means.

* * *

WHEN annealing coiled rod, the coils, supported vertically from a yoke, are immersed in the molten bath by means of a hoist or crane. The ends of the beam of the yoke come to rest upon supports at opposite ends of the pot on the rim, thus allowing clearance for closing the cover, to minimize heat loss during the annealing cycle.

* * *

A typical annealing bath and charge of coiled SAE 52100 stock is shown in Figure 3. Such salt baths are well established in commercial use for process annealing of wire rod composed of engineering grades of steel, bearing steels, etc.

* * *

IN such installations the salt used in the bath is most commonly a mixture of sodium carbonate and potassium chlorides. These mixtures will be found available as a standardized supply item handled by a large number of well recognized heat treating salt suppliers under their identifying trade names.

* * *

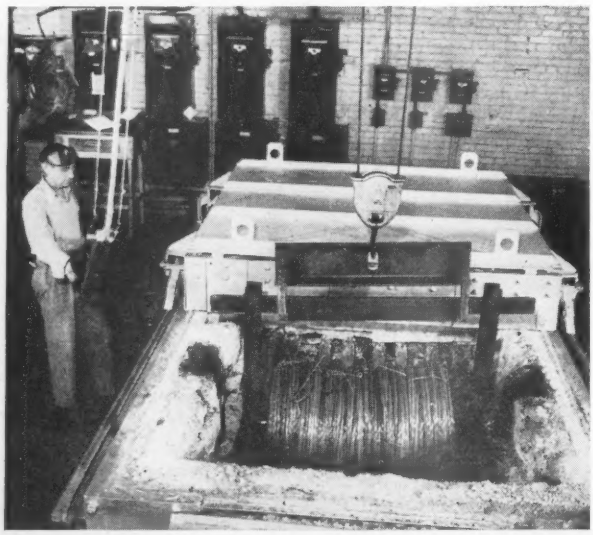

Fig. 3—A 1000 lb. yoke of coiled steel rod is brought to process annealing temperature in less than 20 minutes at 1300 Deg. F.

INTERESTING results are reported from use of such salt in treating ball bearing and needle bearing stock. While the SAE 52100 steel with 1% carbon and 1.5% chromium readily decarburizes in most atmospheres, no appreciable decarburization has been experienced in annealing in molten salt, and there is a total absence of scale.

* * *

COST-CONSCIOUS wire producers will readily appreciate the greatly reduced original equipment investment for equal annealing capacity in favor of the electrode salt bath furnace as compared to conventional atmosphere units. In many instances, the salt bath investment has been as little as one-fourth.

* * *

HOWEVER, the overall operational economy is not so readily apparent. It will be instructive, therefore, to outline cost data for the process anneal of SAE 52100 steel wire in sizes from 0.050 to 0.687 inches where a bath 67″ x 55″ x 67″ salt depth was used. In each 24 hour cycle a total of over thirty loads are annealed. Since the average charge consists of eight coils handled in a saddle yoke, the weight per charge runs about 1000 lbs. Each load is immersed in the molten salt, maintained at 1280 Deg. F. for thirty to forty minutes, then removed and air cooled to below 700 Deg. F. The work is next plunged into water to remove the thin salt layer clinging to the steel surface. A two minute dip in cold 15% sulfuric acid, followed by a thorough water wash and rinse, prepares the wire surface for further processing.

* * *

UNDER these production conditions, the furnace having a connected load of 250 Kw consumes power at the rate of 195 Kw/hr. per ton, while labor assigned to the job consists of only one man. Salt carried out on the metal surface runs about 15 pounds per ton of wire processed. Furnace maintenance is low, since pots and electrodes stand up under these operating conditions for periods approaching three years service before replacements are required.

* * *

IN terms of unit-cost-per-ton, we find the record as follows:

Electric Power	$1.95
Labor	1.60
Maintenance	.17
Salt	.45
Total cost per ton annealed	$4.17

* * *

PRIOR to five years ago, limitations were placed on the use of salt baths by the fact that metal pots even of high alloy construction eroded rapidly under the action of neutral salts at temperatures above 1400 Deg. F. Today this limitation has been removed by the introduction of the ceramic pot, built with refractory tile in lock-joint construction of a material which is compatible chemically with the salt used.

* * *

IN such installations, where higher temperature prevails a different salt is employed than for the carbon steels: a mixture composed chiefly of barium chloride with a small addition of sodium chloride. This salt mixture is a staple item obtainable from heat treat salt suppliers.

* * *

SALT baths used for the treatment of stainless steels are maintained at 1450 to 1550 Deg. F. for the straight chrome grades, and from 1850 to 2100 Deg. F. for the austenitic chrome-nickel grades.

* * *

A brief description of one such installation, illustrated in Figure 5, will be of interest. It is designed for handling the Process Anneal of straight 18-8 and stabilized 18-8 at 1850 Deg. F. and other grades of stainless at 1925 to 1950 Deg. F. Coils of wire ranging in size from 10-gauge rod to finer than 30-gauge wire are loaded on a suspending yoke with special saddle to support the coils immersed in the salt, thus preventing "horse collaring".

* * *

THIS "fine wire" installation treats an average load close to 500 pounds requiring about thirty minutes immersion time. Production is carried out in a single salt bath with bath working dimensions of 42" x 20" x 30" salt depth. Its output in eight hours equals that of six atmosphere-type strand-annealing furnaces previously used in twenty-four hour operation. Only a small fraction of previously used floor space is thus required and the cost-per-pound of annealed wire is comfortably lower than by previous methods.

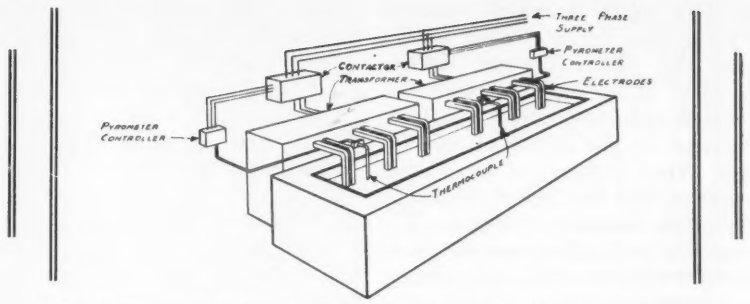

Fig. 4—Diagram of a large Ajax-Hultgren salt bath using six pairs of electrodes divided into separately controlled zones to meet work input requirements.

* * *

WHERE fine stainless wire is annealed, the coils are bound tightly, and with the strands thus held, a water quench may be used with entire satisfaction. A slight oxide film formed on the outside layer of strands is readily removed by a brief pickling — usually in 10% sulfuric, followed by a second pickle composed of about 10% nitric acid with about 1% hydrofluoric acid added and maintained at 130-140 Deg. F.

* * *

THIS is akin to the descaling operations so common in the wire industry and leads to a discussion of this pertinent problem. Wire drawing starts from hot rolled rod which, after suitable reduction through the rolls, must be either fully annealed or spheroidize annealed prior to drawing. All rod or wire coming into the drawing department must be pickled or descaled to remove the heavy oxide scale which has been formed on the surface of the rod during the hot rolling operations.

* * *

IN the case of straight-carbon and low-alloy steels, this is usually accomplished in a heated bath

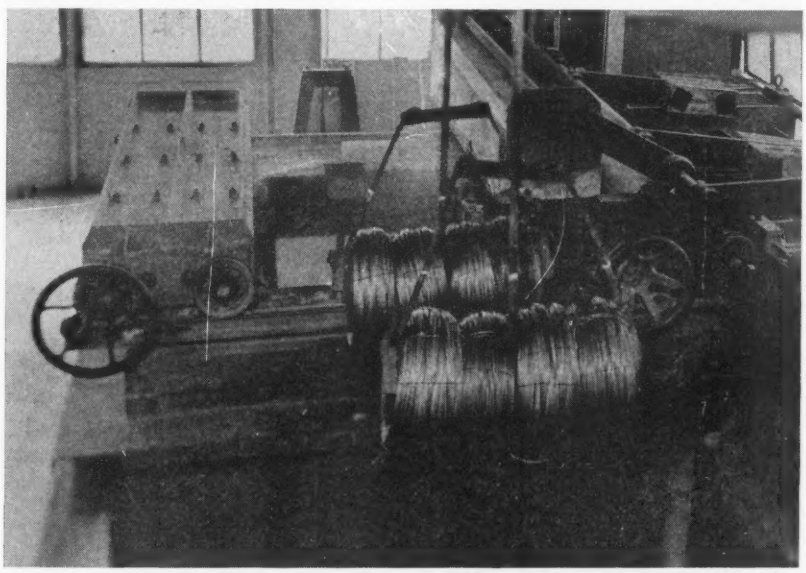

Fig. 5—Double yoke of stainless fine gauge wire showing fixturing for supporting charge. A split cover, designed for combination rolling and lifting movement, reduces heat loss to a minimum at 1850—1900 Deg. F. * * * * *

of hydrochloric or sulphuric acids. Stainless steels, however, present a great deal more difficulty because the oxides on the surface are those of chromium and nickel, a combination that offers stubborn resistance to the action of mineral acids. When pickling of such steel is carried out by use of sulphuric acid pickle followed by prolonged immersion in highly corrosive nitric and hydrofluoric acids, the pickling is accompanied by a considerable loss of metal due to attack on the underlying metal of the rod. Thus, in the stainless steel grades, losses encountered in pickling the hot rolled and annealed rods may run as high as 2-1/2 to 3-1/4% of the metal weight.

* * *

SALT bath methods of descaling are now finding wide application, particularly where chromium and the stainless grades of rod and wire are processed. These descaling baths are composed basically of caustic soda with various addition agents. For this application, the immersed electrode type of salt bath furnace producing heat direcly within the bath, has the inherent advantages of —

* * *

1. LOW **Maintenance.** Pot life is measured in years. A bath heated indirectly through metal pot walls or otherwise results in rapid deterioration of the metal through which heat must flow resulting in short and indeterminate life.

* * *

2. CLOSE **temperature control without any overshoot.** NO appreciable thermal decomposition of the active chemical ingredients some of which are extremely sensitive to excessive temperatures.

* * *

3. HIGH productive capacity in minimum of floor space with heating cycles of about 10 to 15 minutes in the range 700 to 930 Deg. F.

* * *

THESE descaling processes are of two general types; distinguished by the chemical reaction that is used.

* * *

1. THE **reducing** type, introduced by the E. I. du Pont de Nemours Company, uses the reaction of Sodium Hydride to reduce the metal oxides that compose the scale.

* * *

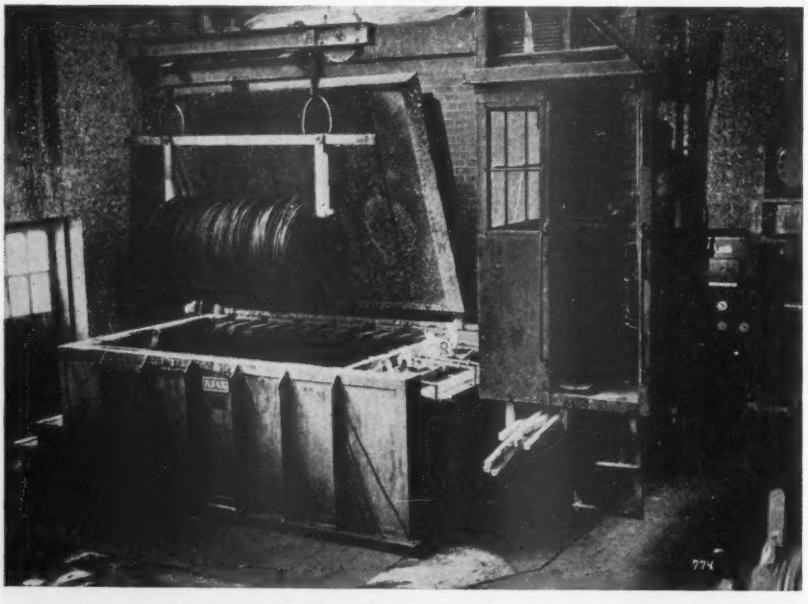

Fig. 6—A 1500 lb. charge of high alloy rod entering a sodium hydride descaling bath. Arrangement of electrodes at the rear and hydride generators at extreme right end of bath, leave clear work zone for rapidly handling work with the gantry crane. A cycle of 15 minutes with bath at 700 Deg. F. completely removes scale. * * * * *

FIGURE 6 shows a yoke o of stainless rod about to b descaled in a Sodium Hydrid bath. This bath, with a connecte load of 200Kw and a workin zone 96″ long by 54″ wide by 60″ salt depth, handles the de scaling of 1500 lbs. of coiled stainless rod on a 15-minute cycle at 700 Deg. F. The tops of the generators for sodium hydride are visible at the extreme right end of this bath.

* * *

THE sodium hydride is maintained at a concentration between 3/4 to 3% of the caustic bath. It is generated in a box-like container immersed partly within the molten salt, usually called a generator, into which are introduced bricks of metallic sodium in an atmosphere of hydrogen or dissociated anhydrous ammonia in contact with the molten caustic within the open-bottomed generator.

* * *

2. THE **oxidizing** types, of which there are several, are composed chiefly of caustic soda with various oxidizing addition agents some of them proprietary in nature. Typical of this group is the Virgo Bath, composed of a proprietary mixture introduced by the Hooker Electrochemical Corporation.

* * *

FIGURE 7 shows an installation of the Virgo Type descaling bath operating in a large alloy steel manufacturing plant.

* * *

THIS mixture modifies chemically the metallic oxide components of the scale in such manner that in the subsequent treatments in acids the metallic oxide compounds are readily dissolved.

* * *

THE temperatures at which these procedures are carried out differ slightly. The sodium hydride bath operates between 700 and 730 Deg. F. The proprietary caustic mixtures of the oxidizing type operate in the range of 925 to 1020 Deg. F. Both use short time cycles varying from 10 to 30 minutes, depending on the nature of the scale to be removed.

AFTER the descaling bath treatment both processes are followed by—

1. A water rinse which removes the salt and all the scale except a close-clinging surface smut.

* * *

A short dip of not over 30 seconds in warm dilute hydrochloric acid followed by a water rinse to dissolve the smut.

* * *

THROUGH use of this practice, the descaling is thoroughly and easily accomplished. The objectionable features common in the straight mineral acid processes, such as pitting, incomplete removal of scale, etc. are eliminated. More interesting are the results from many commercial installations definitely showing that metal losses are close to 1/4 of 1% of the weight of the metal.

* * *

IN the non-ferrous field salt baths find use in the annealing of silver and its alloys at various stages in the forming operations to soften them for further processing, the annealing of aluminum alloy wire, cupro-nickel and the like.

* * *

THE temperatures and times utilized in the stress-relieving of non-ferrous alloys cannot be precisely stated since they depend largely on composition, degree of prior work and the next operation to be performed. Sterling silver, for example, is completely softened at 1225 Deg. F. in a cycle not usually exceeding 10 minutes. Other operations may range in temperature from 700 to 900 Deg. F.

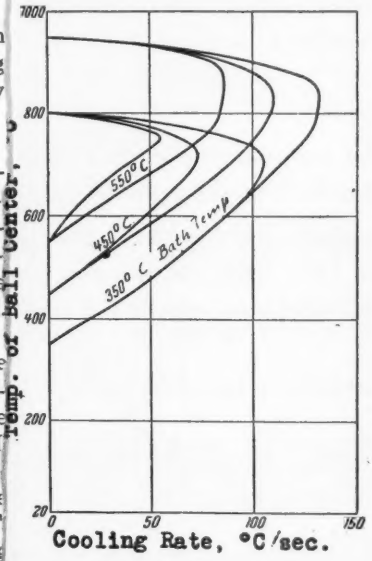

Fig. 8

Fig. 8—Cooling rates at center of 0.47 inch diameter ball quenched from 1472 Deg. F. and 1742 Deg. F. respectively into molten lead at 662, 842 and 1022 Deg. F. * *

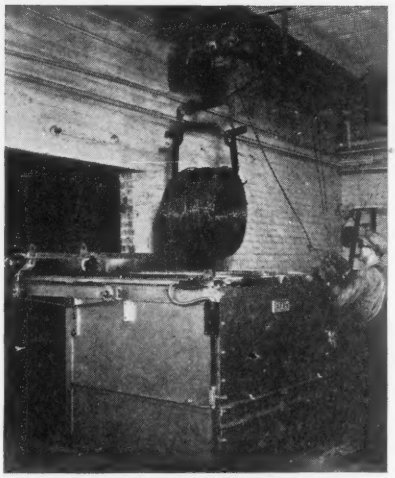

Fig. 7—A charge of 700 lbs. of alloy coiled rod in this single Virgo type descaling bath requires less than 10 minutes to heat to 930 Deg. F. * * *

* * *

THERE is a heat treatment commonly used in wire mills that is, in reality, a psuedo isothermal transformation in spite of the fact that it was in common use long before Time-Temperature-Transformation curves were evolved. The patenting of steel wire is a process in which the work is heated to an austenitizing temperature and then quenched, usually, in a fluid bath maintained at 750 to 1025 Deg. F. according to the types of steel, diameter of the wire, rate of passage through the bath and physical properties desired. Such treatment gives the steel a sorbitic structure which has been found most favorable for further processing of the wire.

* * *

PATENTING of wire is accomplished in equipment which handles the work through the various steps of the process in multiple, parallel strands travelling continuously at fairly high linear rates. Consequently, transformation in the quench bath is completed in a fixed time but during continuous cooling in terms of temperature. According to Wever and Rose, to produce sorbite in plain carbon steel containing more than 0.4% carbon, cooling rates of 180 to 360 Deg. F. per second are necesary within the temperature range of 1202-1112 Deg. F.

* * *

ALTHOUGH lead baths are most commonly used for the patenting quench, there is evidence obtained from the use of molten salt that results indicate advantages in its use as a quench provided the equipment designer and operator are fully aware of the technological and mechanical features that must be varied to adjust for the physical differences between lead and salt.

* * *

THE economic advantages of the internal heating method possible with molten salt have been stressed previously in comparison to external heating methods commonly applied to the heating of lead baths.

* * *

IN Figure 8 and Figure 9 are shown cooling curves obtained at the center of an alloy ball 0.47" outside diameter when quenched into lead and nitrate type salts respectively. The heating bath in both instances was applied at 1472 Deg. F.

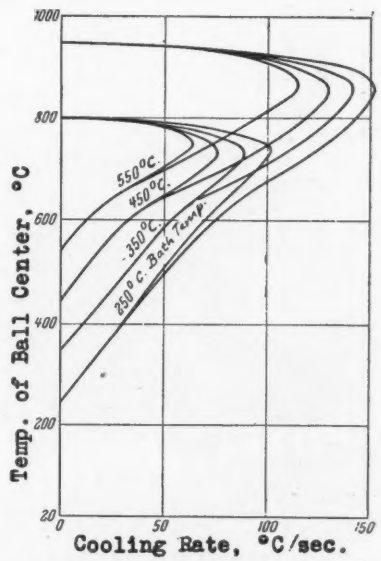

Fig. 9

Fig. 9—Cooling rates at center of 0.47 inch diameter ball quenched under the same conditions as in Figure 8, except that the quench bath is composed of nitrate salts instead of lead. * * * *

and 1742 Deg. F. to provide two sets of data. The quench baths provided data on cooling rates obtained at 662, 842 and 1022 Deg. F. respectively for lead and salt and, in addition, at 482 Deg. F., in only the salt bath quench.

* * *

THIS study, made by Lueg and Pomp (Stahl und Eisen — volume 61, pp 266-272, 1941) shows that, by operating the salt bath quench about 45 Deg. F. lower than the lead bath quench, the same cooling power is obtained, as evidenced by the fact that equal tensile strength and metallographic structures are obtained.

* * *

FURTHERMORE, these investigators point out that "the cooling speeds, and hence the cooling power, increase with decreasing temperature differentials" only in the case of the salt quench.

* * *

THESE factors should be an invitation to further broaden the use of the salt bath in place of the lead bath as the quenching medium for wire patenting.

* * *

SUMMARY

THE number of successful installations of all classes, of which several have been touched upon in this text, now operating in the wire industry is indicative of even wider usage of the modern salt bath furnace within the immediate future.

* * *

SALT baths have undergone marked improvements in the electrode method of heating, engineering constructional features and the types of salts employed since they made entry into the wire processing field. All salts are now staple mixtures identified under definite trade names and backed by the services of trained field engineering staffs of the salt companies. This is in contrast to the exorbitantly high cost of special salts that, in the early days, brought liquid baths equipment into the processing field "on the wrong foot", figuratively speaking.

* * *

POTS, previously limited in range of application can now be built in any size or shape either from heavy welded plate or lock-joint ceramic tile according to types of salt or temperature range required. Newer concepts of electrode design with utilizations of improved alloys have greatly extended their operating life.

* * *

IN fact, advances such as these have made it possible for many salt bath installations to be completely conveyorized — wherein work is automatically processed through a continuous series of operations, assuming uniformity of product and maximum output per unit of equipment, with minimum reliance of individual judgement in the realization of a prescribed cycle of heat treatment.

* * *

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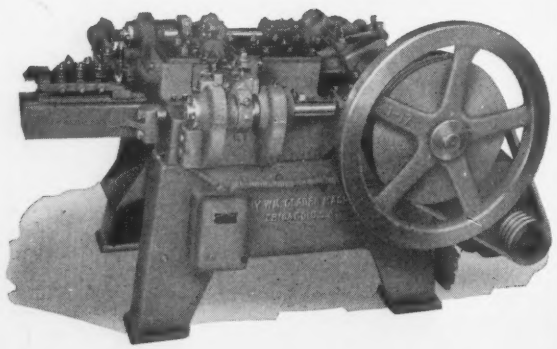

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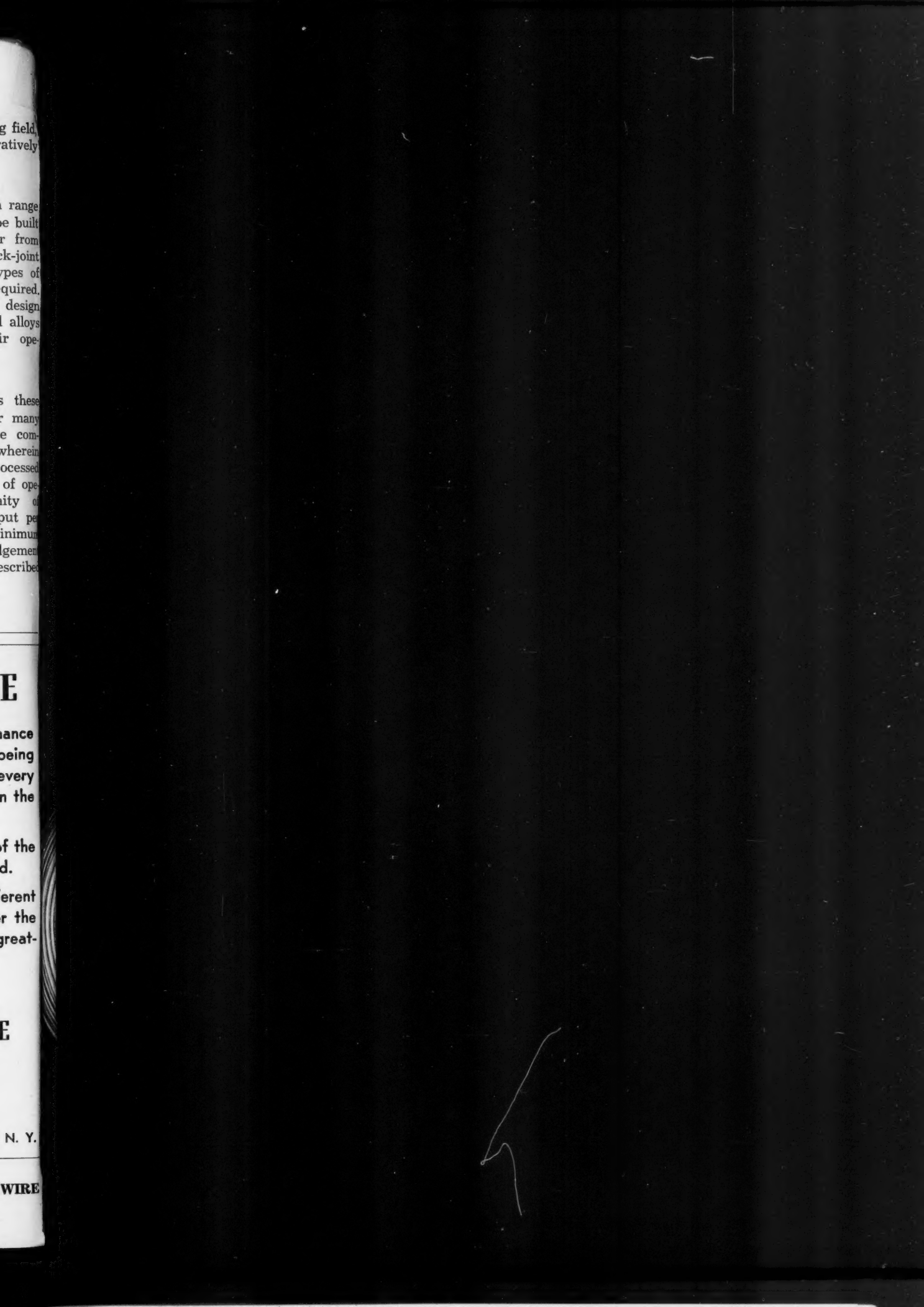

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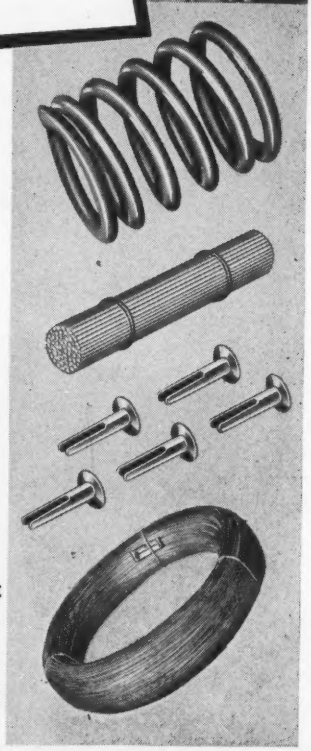

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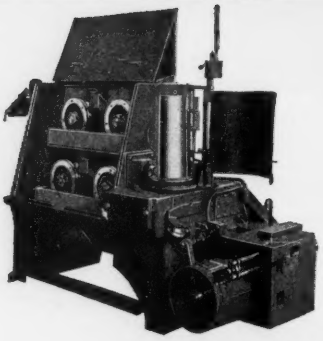

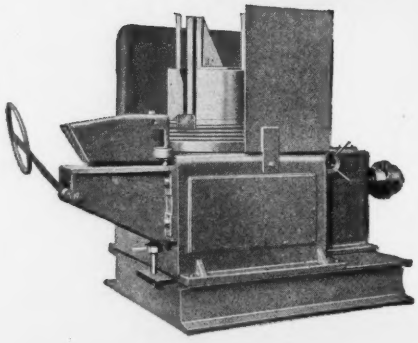

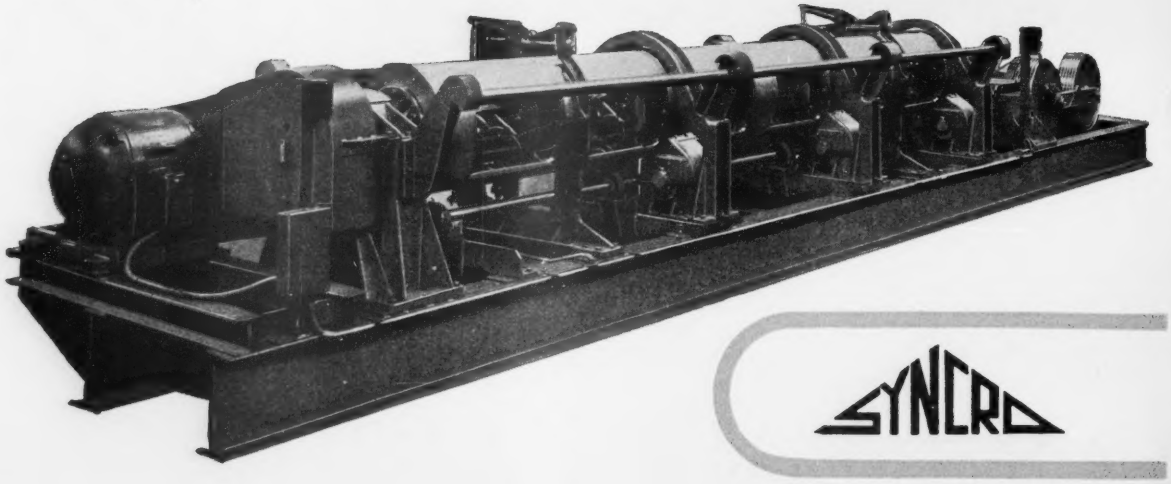

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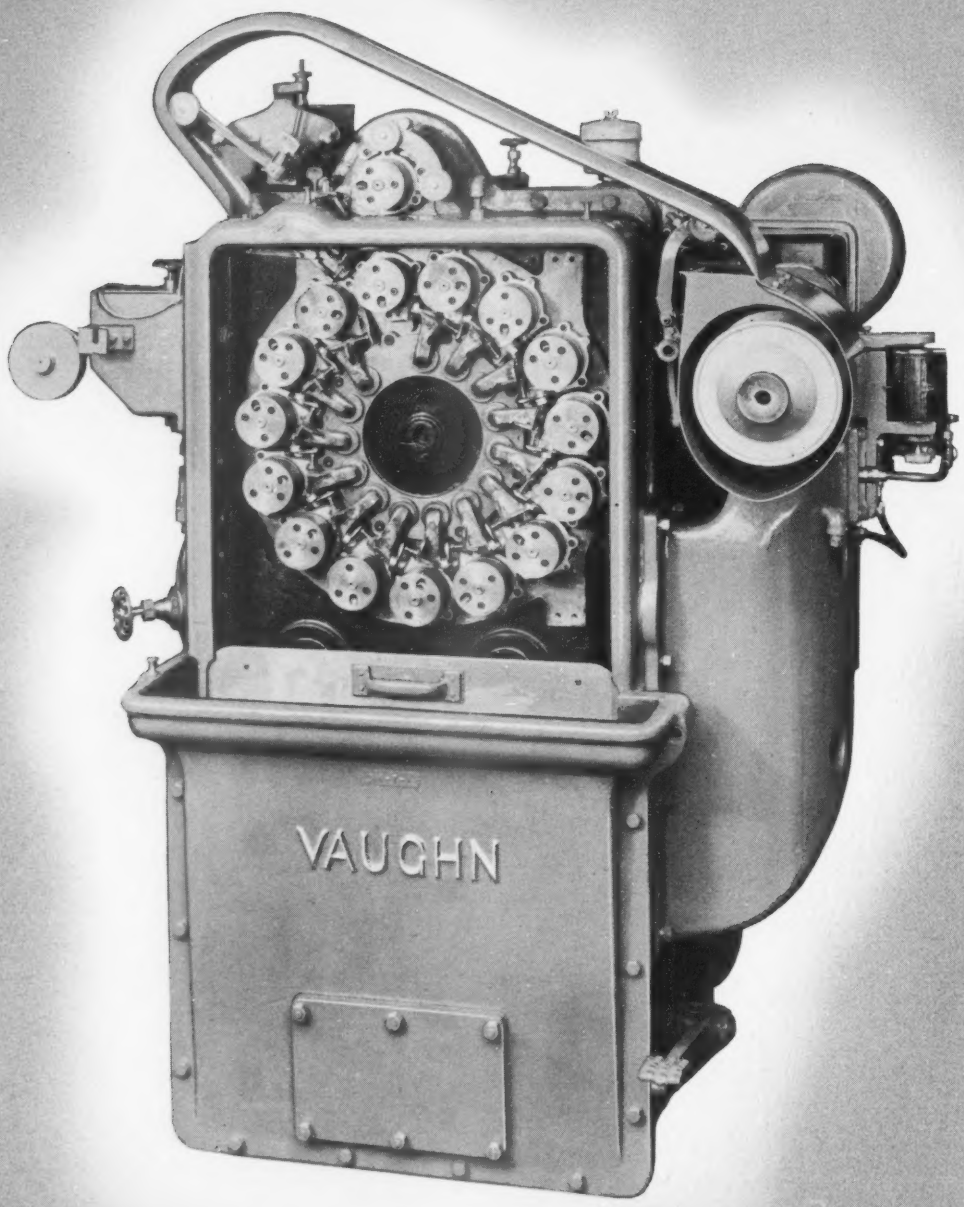

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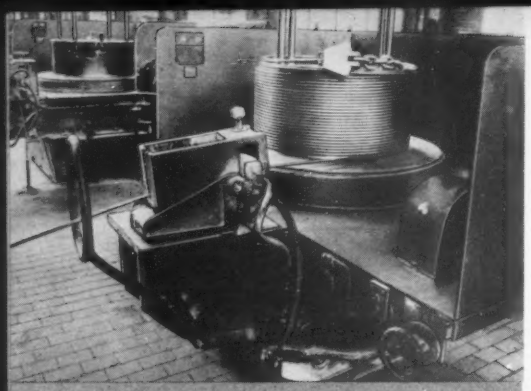

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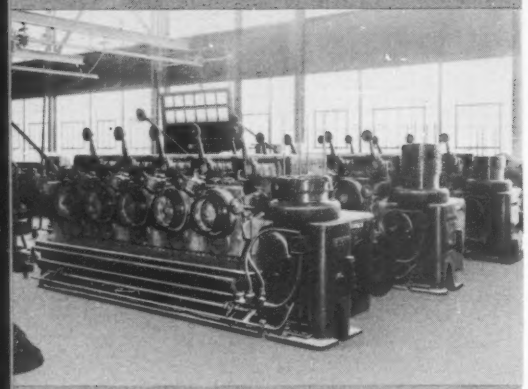

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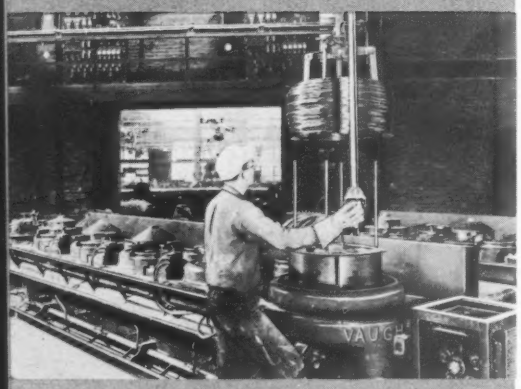

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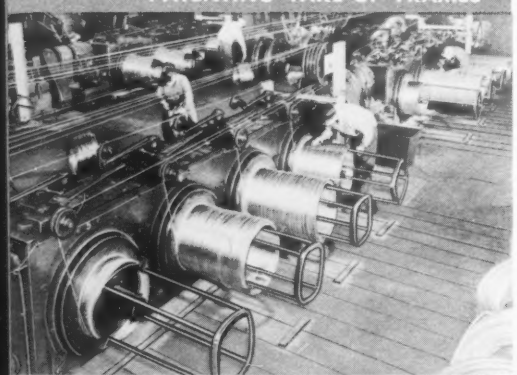

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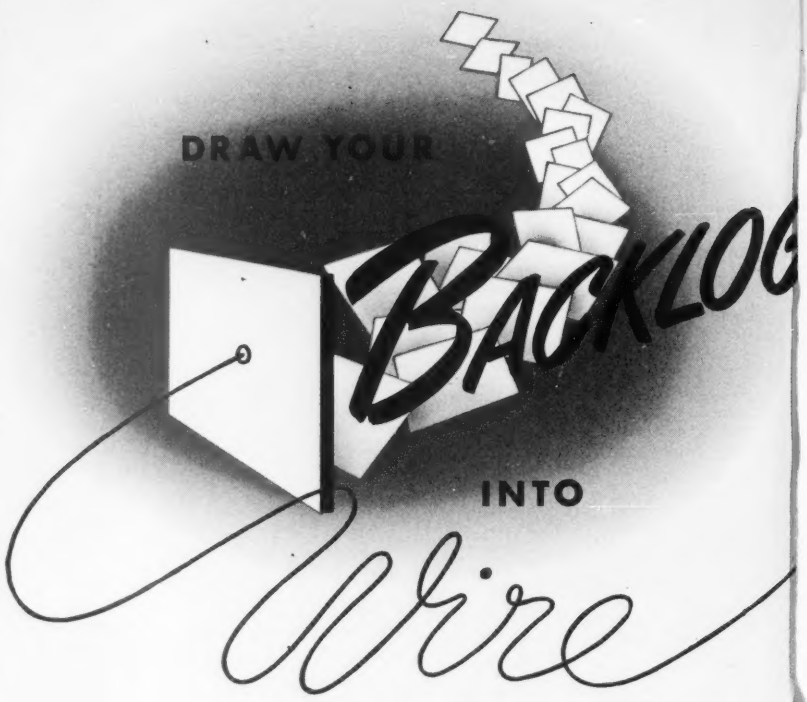

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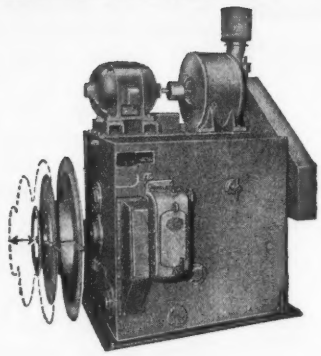

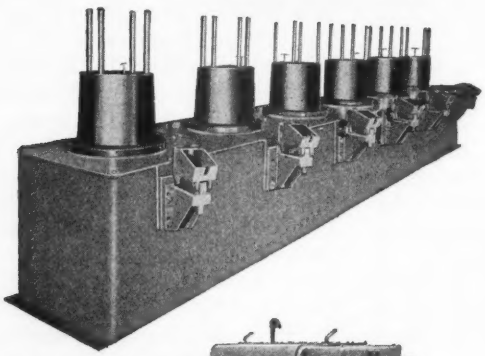

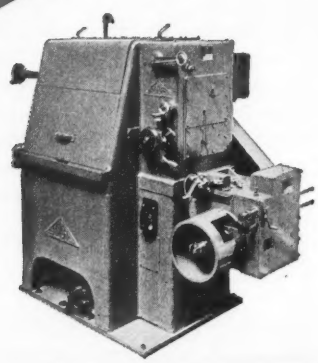

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by James H. Janssen, Ph.D., Metallurgist
Chief Metallurgist, Buffalo Plant
Wickwire Spencer Steel Division
Colorado Fuel and Iron Corp.
Buffalo, New York

Wire Drawing procedure to improve the quality of the larger sizes of rope wire. A paper presented at the Wire Association Convention, Chicago, Illinois, October 1947.

IN the drawing of high carbon wire (.40 — .85 carbon) it has been for several years the contention of some outstanding metallurgists (1), (2), (3), (4), that they must use approximately a 12° smoothing-out angle and very light percentage of reduction to produce their desired results. When the steel being used is of the proper structure, namely, fine pearlitic sorbite, Fig. 1, and small enough in diameter (.100" to finish .035" smaller) to produce a good metal flow throughout the entire cross section, this procedure is entirely correct. In breaking down patented rods into the final patent size to produce the desired size and physical properties in the finished wire, the die angle and drafting is seldom taken too seriously. The ordinary procedure in this breaking down operation is to draw the rods 1½ sizes per hole, as specified by the American Steel and Wire Gauge. Thus a 5 gauge rod would be drawn as follows:

5 ga.	Starting size	.218	
6½ga.	First hole	.185	28% ROA
8 ga.	Second hole	.162	23% ROA
9½ga.	Third hole	.142	23% ROA

* * *

AFTER the rod is broken down to its final patented size, repatented, cleaned, baked, and ready for the final operation, then science takes a hand and endeavors to produce a perfect wire. Here again a very important factor is overlooked.

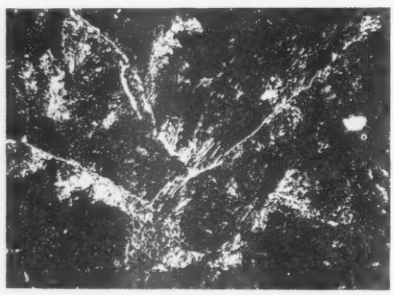

Fig. 1

Where, except, on rare occasions, does one find this perfect structure so desired in patented wire, especially when tonnage is the prime factor. It is common knowledge that the flow of metal in the drawing operation penetrates through the entire cross section, but as is also known a chain is only as strong as its weakest link. In other words, with a poorly patented structure, one having considerable coarse pearlite, it is reasonable to assume and has been proven by extensive study, by the writer, prior to World War II, that this light drafting and use of small angles in drawing such wire causes the percentage of tough ductile pearlitic sorbite to elongate. The coarse pearlite resists this deformation to a greater degree, thus producing uneven grain flow. If measures are not taken to correct this condition early in the drawing operation we produce a wire of the correct diameter, possibly the correct tensile strength in pounds per square inch, but when a torsional test is given, the wire is found to be lumpy and very erratic (Fig. II). Fig. III shows good uniform torsions resulting from uniform grain flow. Often times before the wire reaches its final size breakage occurs. After several attempts to draw wire with these results, to no avail, it is given up as a bad job and put back in stock to be repatented and drawn to a smaller size at a future date. This failure commonly known as cold-draw breaks, Fig. IV, and also the lumpy and erratic torsion is generally found in the larger size of rope wire, the common remedy is to reduce the reduction per draft, for it is believed that the drafting is too heavy. Actually what has happened is that the pearlitic sorbite throughout the cross section and possibly some of the pearlite close to the surface, especially the smaller grains, have been elongated to their maximum length or at least the larger grains of pearlite have failed to elongate appreciably. When this breakage occurs it is found upon microscopic examination that in this cup and cone or cold-draw break, the center grains have just failed

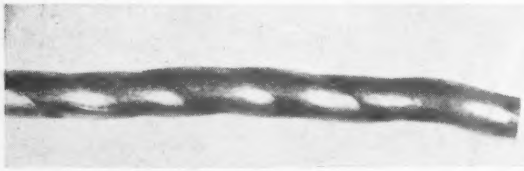

Fig. 2

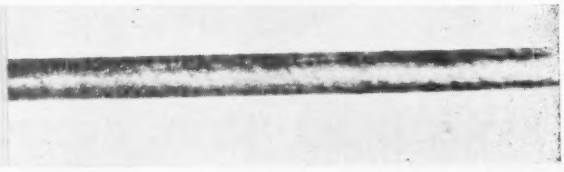

Fig. 3

to flow, upon coming in contact with the drawing die, the outside having been drawn to the limit of its endurance, gives way, and we have a break similar to that pictured in Fig. IV and V. It is the writer's contention derived from previous work, that much of the cuppy condition found in rope wire is caused by poor break-down practice in conjunction with poor drafting practice to final size. This covers both one hole drawing and multiple drafting under 25 per cent reduction per draft. While it is possible under ideal conditions of good dies, good steel, and good patenting, to obtain comparable results with low break-down reductions, it will be shown that since these ideal conditions are seldom reached, this is not good standard practice.

* * *

Experimental Procedure

THE experimental procedure was set up to be tried as soon as equipment could be made available. As time passed it was decided to incorporate the experiment with production. The opportunity presented itself one day when .250 patented rods were being drawn three holes as follows:

Patented rod	.250		
First hole	.230	15%	**Reduction**
Second hole	.212	15%	"
Third hole	.195	15%	"

* * *

BREAKAGE was occurring on the second and third hole, the drafting was then changed to the following, with comparable results:

Patented rod	.250		
First hole	.238	10%	**ROA**
Second hole	.227	10%	**ROA**
Third hole	.216	10%	**ROA**
Fourth hole	.206	10%	**ROA**
Fifth hole	.195	10%	**ROA**

* * *

AT this time the following unorthodox practice was put into effect in an endeavor to produce this .195 wire. Previously, as was common practice in all high carbon wire, 12° angle dies were being used. This was changed to 20° dies and the reduction per draft increased to 25%, as follows:

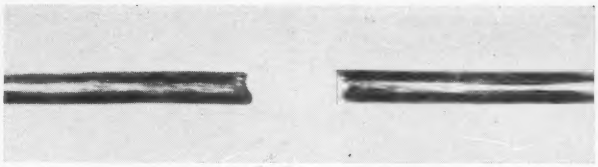

Fig. 4

Patented rod	.250		
First hole	.225	25%	**ROA**
Second hole	.195	25%	**ROA**

* * *

AFTER putting this two-hole drafting into effect no more trouble was encountered. With this success it was decided to try a few more experiments with the heavier drafting using larger angle dies. The result is the use of not less than 20 per cent reduction per draft and up to 40 per cent reduction for each hole. In order to show the effect larger angles and heavier reductions have on the grain flow Figs. VI, VII, VIII are given. The physical properties given in the following table were obtained by drawing as follows and correspond to the photomicrographs, shown in table A:

* * *

WHEN using continuous drawing in conjunction with uncooled blocks, wire of slightly higher tensile strength in pounds per square inch is produced, but the torsions will be low and erratic. Water cooled blocks decrease the tensile strength slightly, but the resulting torsions definitely improve. The following is a duplicate of some of the results in this connection made from a heat of steel .76 carbon and .55 manganese drawn 5 holes 80% ROA using 12° dies:

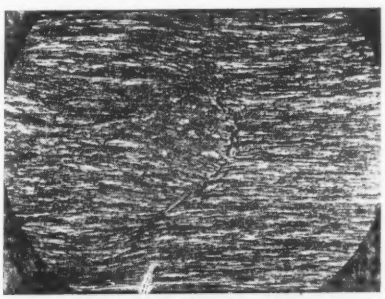

Fig. 5

TABLE A

Holes	Total ROA	Die Angle	Dia.	Tensile	%Elong.	Torsions	Bends
Fig. VI							
5	80%	12°	.110	250,000	2.8	30	68
			.110	254,000	2.5	26	70
Fig. VII							
5	80%	20°	.110	252,000	2.5	30	74
			.110	250,000	2.9	29	75
Fig. VIII							
4	80%	20°	.1095	260,000	3.0	33	79
			.1095	261,000	3.0	34	74

TABLE B

Die.	Elong.	B.S.	T.S.	Torsions	
.115	2.0	2430	234,000	23	Blocks cooled
.1145	2.5	2450	238,000	31	" "
.114	2.5	2460	241,000	27	" "
.115	2.5	2450	236,000	28	" "
.115		2625	253,000	24	" "
.114		2300	225,000	29	" "
.115		2550	246,000	6	Blocks hot
.115		2500	241,000	15	" "
.114		2500	245,000	20	Blocks warm
.114		2400	235,000	21	" "

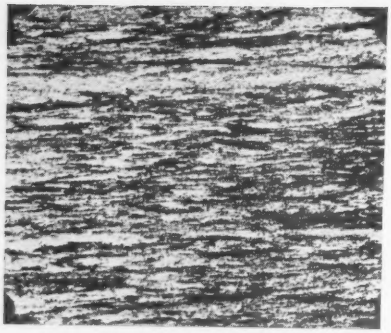

Fig. 6. 5 hole 80% — 12° dies * * * *

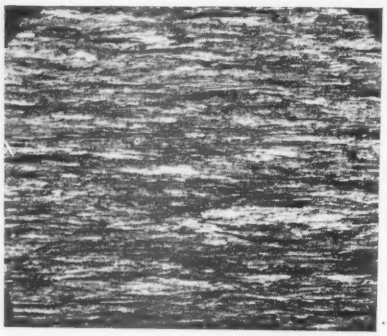

Fig. 7. 5 hole 80% — 20° dies * * * * *

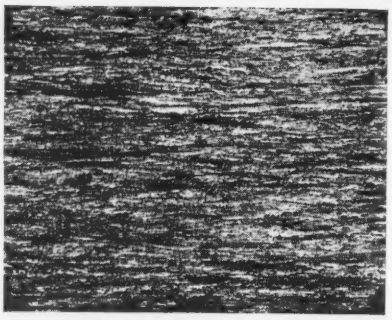

Fig. 8. 4 hole 80% — 20° dies * * * * *

THE speed of the drawing block, consequently the speed of the drawing operation, varies greatly in different mills. Along with the cooling previously mentioned and the improvements in drawing compounds it has been possible to successively draw wire in .063" and smaller sizes as fast as 1500 ft. per minute on a production basis. The determining factor is the amount of cooling between drafts.

* * *

Conclusion

THE experiments performed and the results obtained, point to the fact that cooled blocks along with heavier drafting definitely improve the physical properties of high carbon wire, especially in the larger sizes. It has been known for a good many years that the heavier drafting of low carbon wire necessitates the application of a larger angle die and this must be employed in high carbon wire as well.

* * *

ALTHOUGH this paper refers to the production of rope wire, this drawing procedure has been found applicable also in the case of eutectoid steels.

* * *

THIS is not a "cure all", but the article has been written with the hope of helping solve one of the many problems in the drafting of this type of steel.

* * *

References:

(1) A. T. Adams—"Wire Drawing and the Cold Working of Steel", 1936, page 41.
(2) E. A. Atkins—"The Drawing of Steel Wire and its Relation to Qualities of Steel", Journal of the Iron and Steel Institute", 1927, No. 1, page 443.
(3) George Sachs, Kent R. Van Horn—"Practical Metallurgy", pages 380-392.
(4) Metals Handbook 1939 Edition, pages 876-879.

The writer is greatly indebted to the late B. L. McCarthy for his valuable assistance.

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The Fabrication of Tungsten Wire

by Sidney Schein & Jack W. Forbes

Cleveland Tungsten, Inc.
Cleveland, Ohio.

A discussion of the processes followed in the production and fabrication of Tungsten Wire. A paper presented before the Wire Association at Chicago, Illinois, October 1947.

ONE of the least known of commercial metals is fabricated tungsten. In spite of the fact that this material is not drawn in tonnage quantities, but rather in gram quantities, its use is very wide spread and it is an important material in our everyday life. Tungsten rod, in sizes that are comparable with the smaller steel and alloy wires, is used very widely, if only in comparatively small quantities. For example, many industries use tungsten in the latest type welding operations; the automotive industry uses tungsten as contacts for ignition and starting systems and in accessory parts, such as: horns, voltage regulators, switches, and circuit breakers. These applications use tungsten which has been processed to 3/16″ diameter and smaller.

* * *

BY far the largest volume of fabricated tungsten consumed today, is in the incandescent and flourescent lamp industries and in vacuum tube manufacturing for the electronics industry. Our homes and factories are lighted with incandescent and fluorescent lamps. In the incandescent lamp, it is the tungsten filament that gives off the light, and it is the tungsten filament that burns out at the end of life. Moreover, the most recent development in lighting, the fluorescent lamp, not only employs tungsten filament but the fluorescent coating itself contains approximately sixty per cent tungsten. The heart of the radio tube that we use in our homes is the tungsten filament, and in the new miniature tubes, the grid, as well, is pure tungsten. The large power and transmitting tubes and industrial tubes contain considerably more tungsten. Not only the filament, but the grid wires, support pieces and plates are made of tungsten. Gas and oil fired furnaces are frequently controlled by means of tungsten contacts or rods used in the automatic gas pilots and starting devices. Our X-ray machines, ultra-violet, and infra-red lamps are all dependent on the use of tungsten.

* * *

NEW methods of welding have been developed around the use of tungsten electrodes. The atomic hydrogen arc and the heliarc methods, which are now coming into prominence, use tungsten electrodes. In short, while a great tonnage of tungsten is not produced, in comparison to other metals it is very widely used and makes an important contribution to the needs of our daily life.

* * *

BECAUSE tungsten is so different from most of the other commercial metals and because its processing is done generally by different methods which were developed in research laboratories, a rather queer system of measurement and description has grown up. It has been said, with some degree of truth, that while one does not have to be crazy to be in the tungsten business, it helps. Illustrative of this, is the system used in the trade to describe the various dimensions and quantities. Tungsten ore is purchased both in long tons and short tons and also by the number of units of tungsten oxide contained. One unit is equivalent to twenty pounds of oxide. When the tungsten is extracted from the ore and purified, the resulting compounds, such as: sodium tungstate, tungstic acid, or tungsten oxide are sold by the pound. These compounds are further processed into pure tungsten metal and are generally sold in that form by the kilogram. The tungsten metal, further processed into rod, is sold by the kilogram.

* * *

THE terminology used to describe tungsten is somewhat different than that used for other wire types. Any size above sixty thousandths diameter is commonly known as rod. From sixty thousandths to ten thousandths is known as wire; and below ten thousandths diameter, it is known as filament. The **average** size of tungsten wire used is smaller than the finest commercial steel or copper wire. In other words, the drawing of tungsten largely begins at the point other wires leave off.

* * *

THE diameters are expressed in thousandths of an inch; but the length, in millimeters. The rod, further processed into wire down to ten thousandths of an inch diameter, is sold by the kilogram; and the diameters are expressed in thousandths of an inch. Below ten thousandths of an inch diameter, the wire is sold on the basis of a thousand meters; and the diameter is expressed in milligrams per 200 millimeters. This figure has a definite relationship to the diameter expressed in thousandths of an inch. It is obtained by weighing on a very sensitive balance, a 200 millimeter length. Since the length is always constant, and it is assumed that the density is always constant, the weight of the piece represents the diameter.

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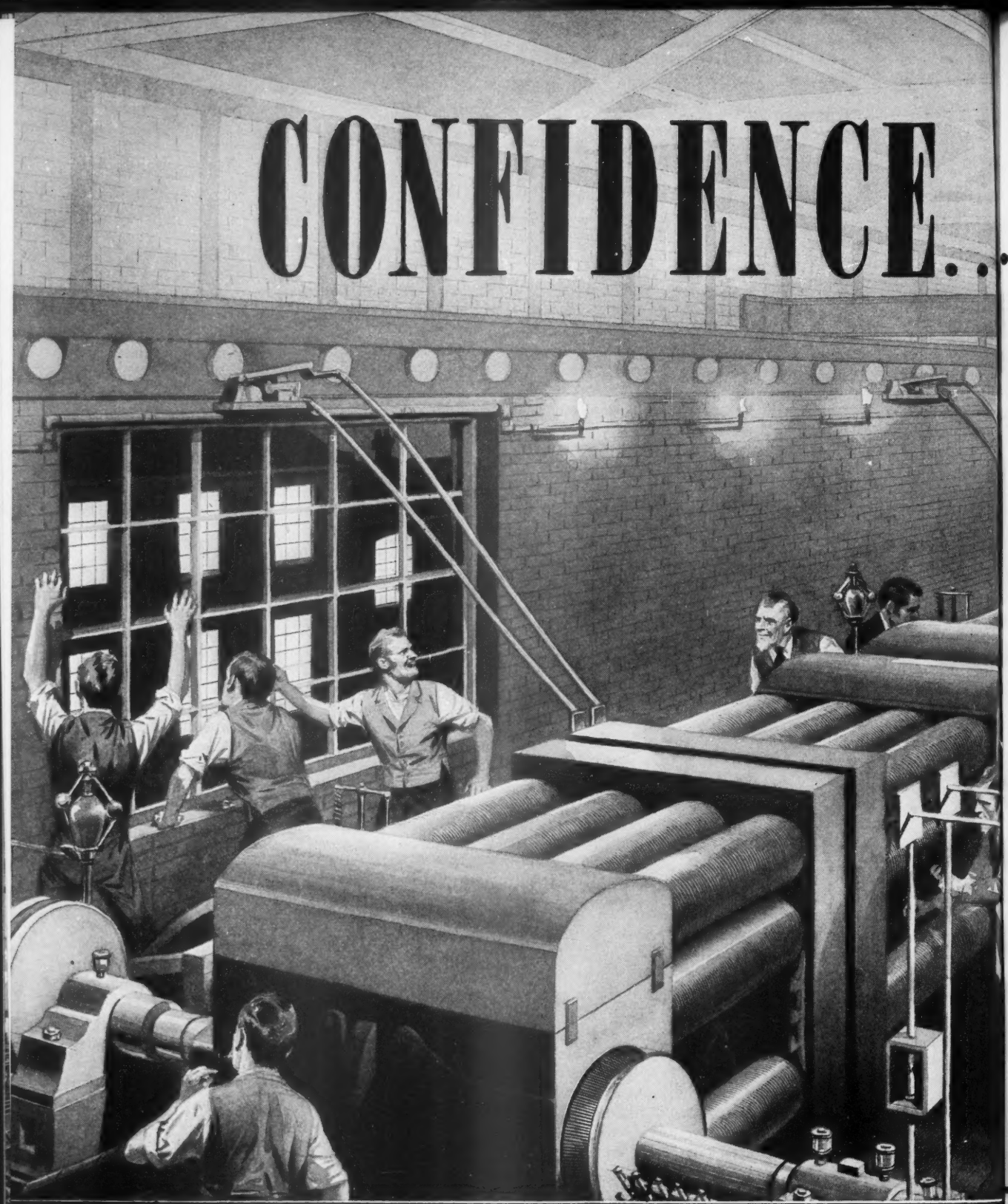

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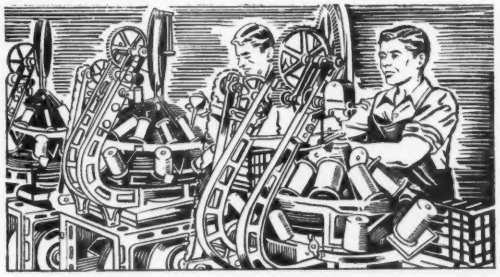

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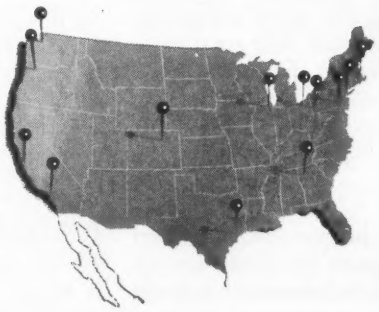

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ROEBLING

A CENTURY OF CONFIDENCE

TUNGSTEN metal is one of the very few metals used commercially in a very pure state. Most metals are alloyed or modified in some manner before they can be used commercially. Iron contains carbon; copper, various deoxidizing materials. Nickel contains manganese. Aluminum contains silicon, iron, copper, and magnesium. Silver contains copper or other hardening agents. Gold contains some form of modifier or alloy material in order to make it useable commercially. Tungsten, as used in the industry, has a purity higher than 99.95 plus. Because of this extreme purity, the presence of accidental impurities to the extent of one or two thousandths of a percent very greatly modify many of its characteristics. In a few cases, minute quantities of impurities are deliberately added to tungsten for certain special applications, and the resulting material has entirely different characteristics than that of pure tungsten. These additives may be thought of as "metallic vitamins" for they are as important in the tungsten, as vitamins are in the human body. It is interesting to speculate on the properties of the more commonly known metals were they used in as pure a condition as that of tungsten, and to also speculate on the properties that could be obtained by the addition of such metallic vitamins.

* * *

TUNGSTEN has the second highest melting point of all the known elements and is exceeded only by carbon. The commonly accepted melting point is 6116°F. The density of tungsten is 19.3, about the same as gold. Up to a few years ago, tungsten was described in the literature as a very hard refractory metal with slight ductility. Actually under today's practice, it can only be considered as refractory, meaning it has a high melting temperature, because as a matter of fact, tungsten is not particularly hard. It has a hardness of approximately 40 to 45 Rockwell C in rod form, whereas high speed steel under the same conditions of testing has a hardness of 65 C. As far as ductility is concerned, a 1″ bar of tungsten can be drawn to filament less than one thousandth of an inch in diameter without annealing. As you can well appreciate, this is a considerable reduction in area.

* * *

TUNGSTEN is not a particularly noble metal. True, it is resistant to many chemicals. It is hardly effected by any of the mineral acids, such as: nitric, hydrochloric, sulfuric, or phosphoric. It is not attacked by the common alkalis, such as caustic soda or caustic potash. At elevated temperatures, however, it oxidizes fairly readily although the oxide is protective

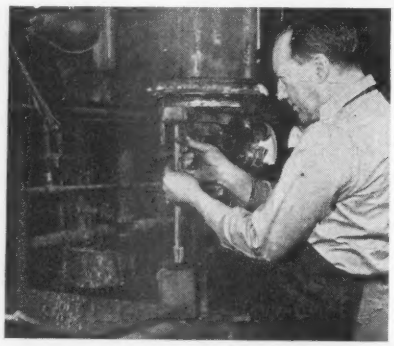

Fig. 1—Inserting a pre sintered tungsten ingot into the water jacketed treating bottle * *

up to temperatures of approximately 1500°F. Tungsten is rapidly attacked at elevated temperatures by such oxidizing materials as molten sodium nitrate, sodium nitrite and a mixture of hydrofluoric and nitric acids.

* * *

BECAUSE of its extremely high melting point, tungsten metal is never melted in any of its processing. Pure tungsten metal is obtained from its compounds by means of hydrogen or carbon reduction in the form of a very fine powder. The fineness of the powder is carefully controlled during the reduction process. This has an important bearing upon the purpose for which the tungsten is to be used and in the subsequent operation. It is a matter of interest to note that the powdered metallurgy process was developed in order to produce tungsten in useable form. In the past few years this method of processing has become important in other metal processing fields, and is on the threshold of a considerable expansion program.

TUNGSTEN rod, wire, and filament is produced by using commonly-known processes with some modification. Swaging is used to form rod, instead of rolling or extruding. The drawing is done using carbide and diamond dies; but here the similarity to other metals ceases. The swaging is done hot at temperatures varying from 2800°F to 1800°F. The drawing is also done hot with the temperatures varying from 2000°F to 900°F. The use of hot working brings up many problems, which the ordinary methods of working do not have to contend with. It has been necessary to develop high temperature furnaces with protective atmospheres and to develop lubricants which will retain their lubricating properties at white hot or red hot temperatures.

* * *

WHILE tungsten has some similarities in its mechanical properties to the more common metals, it still has many properties that are exactly opposite. For example, as we process steel into wire it becomes increasingly harder and less ductile. If we exceed certain limits, the steel becomes brittle and finally breaks. If before we reach this point, we anneal the steel, it becomes soft and ductile. When we start to process tungsten, the material is very brittle but relatively soft. The more we work this material, the more ductile it becomes. If during the process we anneal the tungsten, it again becomes brittle and considerable working is necessary before its ductility is restored. Tungsten in sizes above twenty thousandths is usually brittle, but not necessarily hard, at room temperatures. However, if we heat the tungsten a few hundred degrees, it becomes quite ductile and can be formed quite severely. In other words, if we lived in a world in which the temperature were 500° to 600° higher than our usual temperature, tungsten would be considered as a ductile material rather than a brittle material. On the other hand, if we lived in a world in which our temperature were 200° to 300° below our present temperature, steel would act very similar to tungsten as we know it.

TUNGSTEN ores are processed by a rather complex chemical treatment from which sodium tungstate, tungstic acid, or tungsten oxide are obtained in a highly purified state. These compounds are then reduced by means of hydrogen in a flat hearth tube furnace under carefully controlled conditions. The particle size of the material is carefully controlled by means of the charge, the hydrogen flow, and the rate of reduction. The temperatures used vary from 1300°F to 1900°F and a large unit can produce approximately 2500 pounds per twenty-four hours. For wire purposes, the average particle diameter of the tungsten metal is from three to four microns.

* * *

AFTER reduction, various lots of the metal are carefully blended and mixed in order that the following processes may be successfully carried out.

* * *

THE blended tungsten powder is pressed into bars or ingots by means of a hydraulic press, with pressures up to thirty tons per square inch being used. Because of the processing peculiarities, a maximum ingot of 1-1/2″ square by 24″ long containing approximately eight kilos of metal can be made. An average size ingot, approximately 3/4″ square by 20″ long, contains two kilos of metal. An ingot after pressing cannot be picked up manually, so it is slid upon carbon or molybdenum slabs and given a heat treatment at approximately 2200°F for a short period of time. At this point the ingot can be handled carefully, but is still extremely soft and fragile and has few metallic properties other than the ability to conduct a current. The ingot is next suspended vertically in a water cooled bottle, one end being clamped in a water cooled contact and the other end suspended in water cooled mercury. The interior of this water cooled bottle contains an atmosphere of hydrogen, and during the heat treatment, hydrogen is constantly circulated within the bottle. An electric current is passed through the ingot, and the temperature is raised to approximately 5500°F by means of a current of approximately 6000 Amperes. Approximately 150 KVA is needed to treat such an ingot. The heat treatment takes approximately forty-five minutes. The ingot is cooled within the bottle and then removed.

* * *

AFTER the heat treatment, the ends of the ingot are clipped to remove the untreated or poorly treated portions. During the heat treatment, the ingot has shrunk longitudinally and in cross-section approximately fifteen percent. After clipping, the ingots are introduced into an electrically heated furnace, containing a hydrogen atmosphere and heated to 2700°F. They are then processed hot in a water cooled swaging machine, being reheated between each pass through the dies. Relatively small reduction in areas are accomplished in each pass, an average being fifteen percent.

* * *

AT this point it is well to point out that the processors of tungsten do not ordinarily consider their working in terms of reduction of area, but rather in terms of percent elongation. Since in swaging the diameter is reduced and the length increased, it is somewhat easier to visualize the amount of working if one considers the increase in the rod length. From here on we shall speak of amount of working as percent elongation.

* * *

IN the primary stages of swaging, the ingot is removed from the furnace with a pair of tongs, inserted into the dies for half its length. It is then pulled back and replaced in the reversed position into the furnace for reheating. When it has reached the working temperature, the second end is then pushed through the swaging die. This continues for some twenty dies or until the rod has reached a diameter of approximately 3/10's of an inch. The rods are then transferred to a gas heater, which is placed in front of a water cooled swaging machine; and after being brought up to temperature, are fed continually through the swaging machine where they are picked up by a pair of take up rolls. After some fifteen to twenty passes, the rod reaches a diameter of sixty thousandths and is approximately 150 feet long. The rod, in spite of being reduced from approximately 3/4″ in diameter to sixty thousandths diameter, is still brittle and can be

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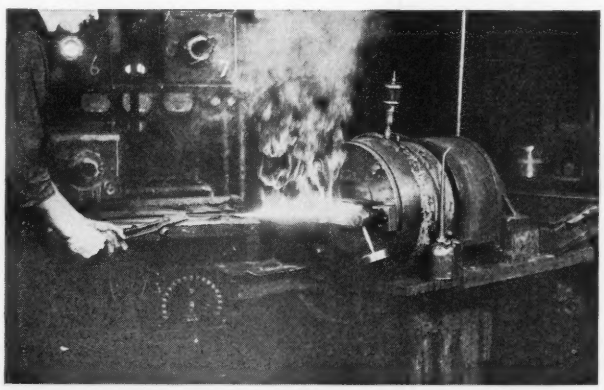

Fig. 2—Hand swaging operation working down the fully treated tungsten ingot to heavy rod. * * * *

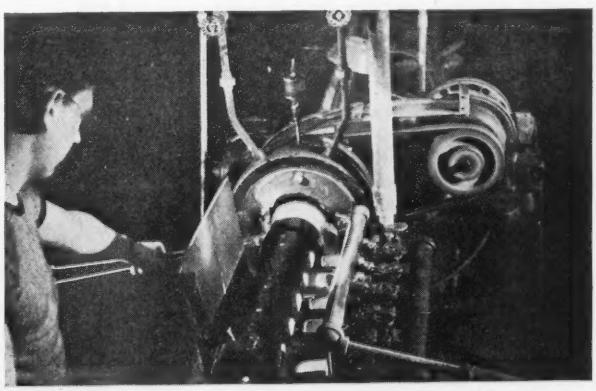

Fig. 3—Processing heavy tungsten rod on automatic swagers * *

Wrought Aluminum Alloys; Their Properties Heat Treatment and General Characteristics

by H. S. Spaulding, Plant Metallurgist
Reynolds Metals Co.
Louisville, Ky.

A paper to be presented at the annual Convention of the Wire Association at Chicago, Illinois, October 1947.

THE use of aluminum and its alloys in various forms grew steadily prior to the war and increased tremendously during the war. As a result of their war work, numerous concerns gained for the first time the experience and techniques necessary for fabricating aluminum, and their favorable results both as to ease of fabrication and consumer acceptance of their products have caused them to continue to use aluminum. This light metal is now taking care of numerous war-born shortages in addition to its standard uses. While some applications may be lost on a price basis when normalcy returns, many of the new jobs will still be done cheaper and better by aluminum.

* * *

BECAUSE of the present widespread interest in aluminum, it is felt that a discussion of the wrought aluminum alloys together with their properties, heat treatment, and general characteristics will be of interest to the members of the **Wire Association.** Emphasis will not be placed on those alloys which are produced in wire form, an attempt being made to give a more general picture by also discussing wrought alloys not produsued as wire.

THE term "aluminum" is used not only for the commercially pure metal but also for the various aluminum-rich alloys which are produced. The alloys of aluminum have a wide range of properties and enable the user to select a material having the property or combination of properties most desirable for a specific application. Tensile strengths, for example, may be obtained with a low of approximately 13,000 psi to a high of about 82,000 psi.

* * *

WROUGHT alloys of aluminum of commercial purity are designated by a number followed by a letter **"S"** or preceded by the letter **"R".** This separates the wrought alloys from the cast alloys which are designated by number only. Aluminum of higher than commercial purity with one exception is specified by the minimum aluminum content; e.g. "99.6%. The one exception is **"E.C."** or electrical conductor metal which is used for a specific application and which contains a minimum of 99.45% aluminum. Aluminum of commercial purity is known as 2S. 2S contains a minimum of 99.0% aluminum with the balance being mainly the iron and silicon picked up during the electrolytic reduction of aluminum oxide. Small amounts of other elements may also be present in addition to the iron and silicon, copper being one of these.

* * *

TABLE I

Alloy Number	Main Alloying Element
2S	Commercially pure aluminum
3S to 9S	Manganese
10S to 29S	
R301 & R317	Copper
30S to 49S	Silicon
50S to 69S	
R353, R361	Magnesium
70S to 79S	Zinc
80S	Tin

This table lists only the main alloying element, in nearly all cases one or more other elements being added to obtain a particular alloy. The nominal chemical compositions of the more important alloys are listed in Table II.

TABLE II

NOMINAL CHEMICAL COMPOSITIONS OF WROUGHT ALUMINUM ALLOYS

Alloy	Silicon	Copper	Magnesium	Manganese	Chromium	Others
E.C.	.....	0.4	(Minimum aluminum 99.45%)		.....	
2S	.....	0.15	.....	.....	.....	
3S	.....	.....	.....	1.25	.....	
11S	.....	5.5	.....	.....	.....	0.5 each lead
14S	0.8	4.4	0.4	.08	.....	and bismuth
A17S	2.5	.....	0.3	.....	.....	
17S	.....	4.0	0.5	0.5	.....	
R317	.....	4.0	0.5	0.5	.....	0.5 each lead
18S	.....	4.0	0.5	.....	.....	and bismuth
24S	.....	4.5	1.5	0.6	.....	2.0 nickel
25S	0.8	4.5	.....	0.8	.....	
32S	12.5	0.9	1.0	.....	.....	0.9 nickel
43S	5.0	.....	.....	.....	.....	
A51S	1.0	.....	0.6	.....	0.25	
52S	.....	.....	2.5	.....	0.25	
53S-R353	0.7	.....	1.3	.....	0.25	
56S	.....	.....	5.25	0.1	0.1	
61S-R361	0.6	0.25	1.0	.....	0.25	
63S	0.4	.....	0.7	.....	.....	
R301 Core	1.0	4.5	0.4	0.85	.....	
Cladding*	0.7	.....	1.0	0.5	.....	
75S	.....	1.6	2.5	0.2	0.3	5.6 zinc

***Hardclad, Pureclad have 99.3% cladding.**
Note: Aluminum and normal impurities make up remainder.

ALLOYS numbered 3S and over are produced by the addition of varying amounts of manganese, copper, silicon, magnesium, zinc and a few others. In general the alloys may be broken down by number into broad classes on the basis of the main added alloying element. Table I lists the alloy number ranges corresponding to main alloying element.

* * *

IN analyzing table II note that the alloys can be grouped according to alloying elements even more definitely than was done in Table I, as follows:

* * *

THIS breakdown is helpful in that the properties and behavior in any one group are quite similar as are the methods of working and heat treatment. To Table II can be added the clad forms of certain of the alloys, these clad alloys being produced by the addition to the base core alloy of a thin layer of an aluminum alloy which is anodic to the core and which thereby electrolytically protects the core under corrosive conditions.

* * *

TYPICAL mechanical properties of the commonly used alloys and tempers are listed in Table III. The wide range of properties available with the various alloys and tempers will be noted. The maximum 82,000 psi tensile strength obtainable compares with the 60,000 psi typical of ordinary structural steel. Many alloys equal or exceed the typical 35,000 psi yield strength of structural steel.

* * *

IN connection with this table some comments on temper designation are in order. The **"O"** temper is that obtained with a full anneal and represents the dead-soft condition of a particular alloy. "Common" alloys, those whose strength may be increased only by cold working, are normally also produced in the full-hard or **"H"** temper and the fractional 1/4H, 1/2H and 3/4H tempers. The **"H"** temper is the maximum amount of cold work practical for a particular alloy, and the amount of cold work for the fractional tempers is regulated so that the proper fraction of the total tensile strength increase between **"O"** and **"H"** tempers is obtained.

Aluminum — Manganese	**3S**
Aluminum Copper (with magnesium, manganese, nickel, or others added)	**11S, 14S, A17S, 17S, R317, 18S, 24S, 25S, R301**
Aluminum — Magnesium — Silicon	**32S, A51S, R353 (53S), R361 (61S)**
Aluminum — Magnesium	**52S, 56S**
Aluminum — Silicon	**43S**
Aluminum — Zinc — Magnesium — Copper	**75S**

* * *

THE main "common" alloys are E.C., **2S, 3S, 43S, 52S and 56S. 56S** in the full hard temper has an unusually high tensile strength, this being a typical 58,000 psi with as high as 65,000 — 70,000 psi being obtained when using the extremely high reductions possible on small diameter wire. Wire with these high strengths still possesses a good degree of workability.

* * *

'W' and **"T"** temper designations are used for those alloys which are hardened by a solution heat treatment in the approximate range 870° — 980°F. followed by a water quench. Such alloys are known as "strong" alloys. Following the quenching operation a precipitation heat treatment (artificial aging operation) is necessary on some alloys to convert them from the as-quenched **"W"** condition to the fully aged **"T"** condition.

* * *

OTHER temper variations are possible in strong alloys by various combinations of cold working and artificial aging, and such tempers are designated with a **"T"** followed by a number, such as **"T3"**.

* * *

SOME of the general properties of aluminum are of interest and these are listed in Table IV, comparisons being made with steel, copper, and magnesium for each particular property.

* * *

IT will be noted that particular aluminum alloys are specified with the values given for electrical and thermal conductivity. Electrical and thermal conductivity are dependent upon alloy analysis and temper, and for this reason the aluminum alloys used in commercial applications involving these properties and therefore possessing the highest such properties are listed. Certain aluminum alloys will have electrical and thermal conductivities as low as 27% and 750 respectively, the same as certain brasses have on electrical conductivity of 26% and a thermal conductivity of 840.

* * *

IN comparing the electrical conductivity of aluminum with that of copper, it should be noted that the values listed in the table are on the basis of equal volumes. Although aluminum has only 61% of the conductance of copper on the basis of equal volumes, it has more than twice the conductance of copper on the basis of equal weights.

* * *

ONE important property which differs considerably from steel is Young's modulus of elasticity, the ratio of unit stress to unit strain within the limits of elasticity of a material. Because of this difference in modulus, an aluminum section will deflect about three times as much under a given load as a steel section of the same size. Because of the light weight of aluminum, however, equal deflections in a simple beam, for example, may be obtained by increasing the area of the aluminum with the result that the aluminum section will still weigh only one-half as much as the equivalent steel section. An aluminum beam section weighing the same as a steel section will deflect only about one-seventh as much as the steel section.

* * *

HEAT treatment is broadly defined as an operation or combination of operations involving the heating and cooling of a metal or alloy in the solid state for the purpose of obtaining certain desirable

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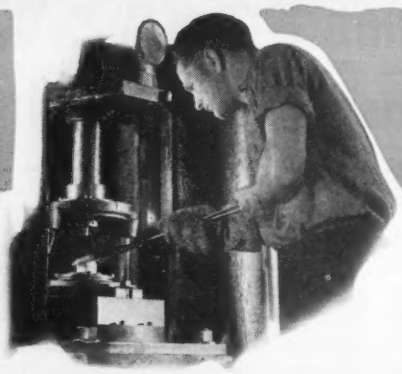

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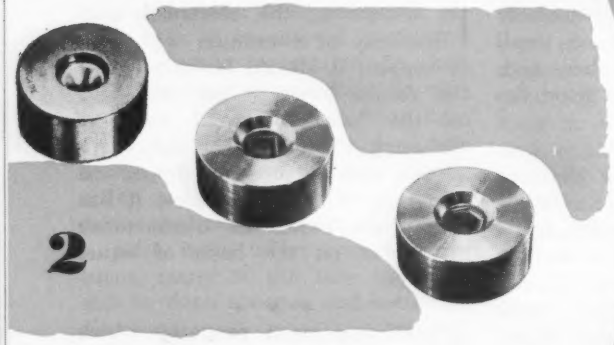

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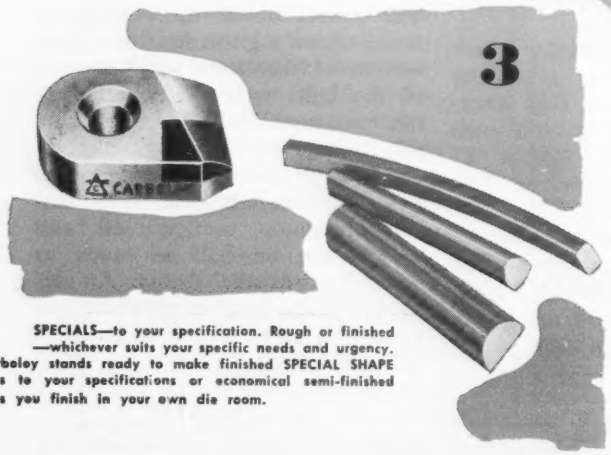

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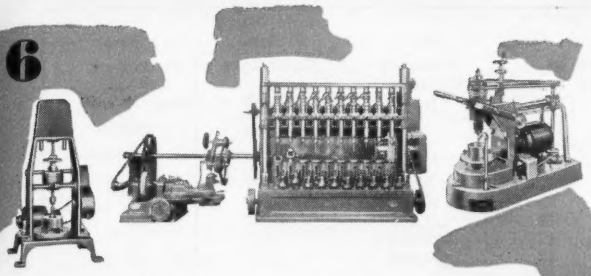

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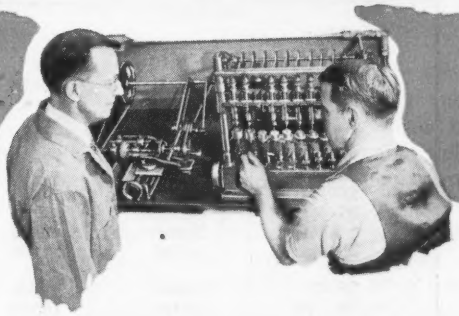

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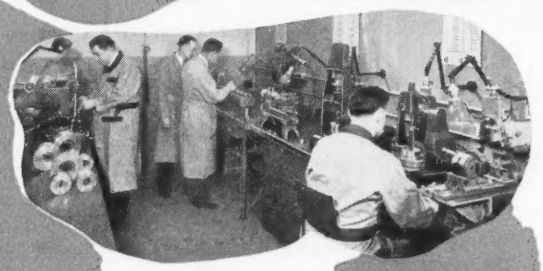

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TABLE III
TYPICAL MECHANICAL PROPERTIES OF WROUGHT ALUMINUM ALLOYS

Alloy & Temper	Tension				Shear	Fatigue	Hardness
	Strength — p.s.i.		Elongation in 2 in. — per cent		Shearing Strength — p.s.i.	Endurance Limit — p.s.i.*	Brinell — 500 kg. lead, 10 mm ball
	Ultimate	Yield	1/16" thick Specimen	½" dia. Specimen			
2S-O	13,000	5,000	35	45	9,500	5,000	23
2S-¼H	15,000	13,000	12	25	10,000	6,000	28
2S-½H	17,000	14,000	9	20	11,000	7,000	32
2S-¾H	20,000	17,000	6	17	12,000	8,500	38
2S-H	24,000	21,000	5	15	13,000	8,500	44
3S-O	16,000	6,000	30	40	11,000	7,000	28
3S-¼H	18,000	15,000	10	20	12,000	8,000	35
3S-½H	21,000	18,000	8	16	14,000	9,000	40
3S-¾H	25,000	21,000	5	14	15,000	9,500	47
3S-H	29,000	25,000	4	10	16,000	10,000	55
11S-T3	53,000	47,000	....	15	30,000	12,500	95
14S-O	27,000	14,000	....	18	18,000	11,000	45
14S-W	56,000	40,000	....	25	34,000	18,000	100
14S-T	70,000	60,000	....	13	42,000	18,000	135
A17S-T	43,000	24,000	....	27	28,000	13,500	70
17S-O	26,000	10,000	....	22	18,000	11,000	45
17S-T	62,000	40,000	....	22	38,000	18,000	105
R317-O	26,000	10,000	....	22	18,000	11,000	45
R317-T	62,000	40,000	....	22	38,000	18,000	105
18S-T	63,000	47,000	....	17	39,000	14,500	115
24S-O	27,000	11,000	19	22	18,000	12,000	42
24S-T	68,000	46,000	19	22	41,000	18,000	120
24S-RT	73,000	57,000	13	....	42,000	.....	130
25S-T	57,000	35,000	....	18	35,000	15,000	110
32S-T	56,000	46,000	....	8	38,000	14,000	125
A51S-T	47,000	40,000	....	20	32,000	10,500	100
52S-O	29,000	14,000	25	30	18,000	17,000	45
52S-¼H	34,000	26,000	12	18	20,000	17,500	62
52S-½H	37,000	29,000	10	14	21,000	18,000	67
52S-¾H	39,000	34,000	8	10	23,000	18,500	74
52S-H	41,000	36,000	7	8	24,000	19,000	85
R353-O (53S)	16,000	7,000	....	35	11,000	8,000	26
R353-W	33,000	20,000	....	30	20,000	13,000	65
R353-T	39,000	33,000	....	20	24,000	13,000	80
56S-O	42,000	20,000	....	35	.....	20,000	....
56S-H	58,000	48,000	....	7	.....	22,000	....
R361-O (61S)	18,000	8,000	22	30	12,500	9,000	30
R361-W	35,000	21,000	22	25	24,000	13,500	65
R361-T	45,000	39,000	12	17	30,000	13,500	95
R361-T81	55,000	50,000	....	12	.....	.....	....
R361-T7	62,000	61,000	....	9	.....	.....	....
63S (as-extruded)	23,000	17,000	....	17	14,000	.....	....
63S-T5	31,000	24,000	....	14	19,000	.....	....
R301-O	25,000	10,000	22	....	18,000	.....	....
R301-W	62,000	41,000	19	....	40,000	.....	....
R301-T	68,000	60,000	10	....	43,000	12,500	....
75S-O	33,000	15,000	17	11	.....	.....	....
75S-T	82,000	72,000	11	10	47,000	22,500	150

*500,000,000 cycles of completely reversed stress using R. R. Moore type of machine and specimen.

TABLE IV
GENERAL PROPERTIES OF ALUMINUM COMPARED WITH OTHER METALS

	Aluminum	Steel	Copper	Magnesium
Density — lb. per cu. in.	0.098	0.279	0.322	0.063
Volume Electrical Conductivity — % of I.A.C.S.	61 (E.C.)	3-15	97	38
Thermal Conductivity at 32°-212°F. B.t.u./in./ft²/°F/hr.	1510 (2S-0)	460	2610	1090
Young's Modulus of Elasticity p.s.i.	10,300,000	29,000,000	16,000,000	6,300,000
Average Coefficient of Thermal Expansion per °F in range 68° - 212°F.	0.000013	0.0000065	0.0000093	0.000013

conditions or properties. Annealing, then, comes within this definition. Annealing of aluminum is performed either to remove strain hardening or to remove the hardening effects of a prior solution or precipitation heat treatment. When annealing strain hardened material, it is necessary that recrystallization take place. Recrystallization occurs in shorter times at increasing temperatures, and finally a temperature is reached where recrystallization is instantaneous. Annealing temperatures used for aluminum give instantaneous recrystallization, and it is necessary only to be sure that all portions of a load have reached the prescribed temperature.

* * *

FOR material in a strain hardened condition, a temperature of 640-670°F. is used for most alloys. An important exception is 3S, which must be anealed at 750-800°F. to cause recrystallization. When he maximum temperature specified is not exceeded, the material after anealing is cooled normally in air. If the maximum temperature is exceeded on heat-treatable alloys containing constituents soluble in aluminum at higher temperatures, a furnace cooling operation to a lower temperature may be necessary for dead-soft properties, the furnace cooling effecting precipitation in a non-hardening form of the soluble constituents.

* * *

AN exception to the foregoing is the annealing of electrical conductor (**E. C.**) metal in order to obtain maximum conductivity. In the case of **E. C.**, maximum conductivity can be obtained by annealing for a 1-2 hour soak at approximately 575°F. in order to precipitate from solid solution those elements which in solid solution form exert a depresing effect on electrical conductivity. A temperature of 640-670°F. is not sufficient to remove all effects of solution or precipitation heat treatment, and where this is necessary the material in the "W" or "T" temper should be heated at 750-800°F for 1-2 hours and then cooled in the furnace to 500°F. at a rate not exceeding 50°F. per hour. This treatment coalesces the hardening constituents present in heat treated material and precipitates them in a non-hardening form.

* * *

HARDENING of the strong alloys is accomplished through a solution heat treatment which, depending on the alloy and properties desired, may or may not be followed by a precipitation heat treatment. Solution heat treatment accomplishes just what its name indicates, the solution in solid form of the atoms of the soluble hardening constituents present with the atoms of aluminum. Such soluble constituents are $CuAl_2$, Al-Cu-Mg, Mg_2Si, and $MgZn_2$. This solution takes place at high temperatures, and to effect the greatest possible amount of solution the maximum heat treating temperature is placed just under the lowest melting temperature of the alloy. This solution requires time even at high temperature, this time depending on the form, size, and degree of dispersion of the hardening material. This in turn is normally dependent on the size of the section being heat treated. Soaking times at temperature of a few minutes for thin sheet to as much as 12 hours for heavy sections are commonly used.

* * *

SOLUTION heat treating temperatures range from 870 to 980°F. depending on the alloy. Exact heat treating temperatures for the various alloys will not be detailed here but may be found in the literature of the various manufacturers. If the maximum temperature for an alloy is exceeded, there exists the danger of eutectic melting. Accurate control of temperature in a furnace work chamber must not vary more than ±10°F. from the nominal for results. On electrically heated forced circulation air furnaces in use in many plants, the variation is actually not over ±5°F.

* * *

CONTROL of furnace atmosphere is not normally necessary where moisture or sulfur compounds are not present, but direct oil or gas fired furnaces are likely to cause high temperature oxidation with possible associated blistering. Excessive high temperature oxidation will result in lowered mechanical properties.

* * *

FOLLOWING the placing in solid solution of the hardening material, this solid solution must be maintained in the alloy by a rapid quench. For maximum hardening effect, this quenching is normally performed by immersing the material at heat treating temperature in a bath of cold water at a temperature of not over 85°F. The volume of water should preferably be sufficient to keep its temperature rise after quenching below 20°F.

* * *

TOO slow a quench results first in impaired corrosion resistance on most alloys followed by loss of mechanical properties with yet slower quenching. Following the quenching operation, alloys A-17S, 17S, R317 and 24S are in the "T" temper. Four days aging at room temperature are necessary for development of the maximum properties of these alloys, a change within the unstable supersaturated solid solution being responsible for this hardening. Other alloys are in the "W" temper following quenching, a precipitation heat treatment or artificial aging operation being necessary to alter the supersaturated solid solution sufficiently to develop "T" properties.

* * *

PRECIPITATION heat treatment or artificial aging to produce the "T" temper is necessary for 11S 14S, R301, 18S, 25S, 32S, A51S, 53S-R353, 61S-R361, and 75S. With this treatment the hardening constituents are almost completely precipitated in submicroscopic form from the supersaturated solid solution retained by quenching. Aging temperatures necessary to cause proper precipitation are in the range 250—360°F. depending on the alloy, and soaking times at temperature vary from 24 hours at the lower temperatures to as low as 5 hours at the higher temperatures.

* * *

USUALLY more than one combination of time and temperature may be used for a particular alloy,

the longer times at the lower temperatures giving the best combination of mechanical properties. Manufacturers' literature should be consulted for exact recommendations regarding aging temperatures and soaking times.

* * *

RATE of heating to temperature is not critical so long as all parts of a load are brought to soaking temperature within a reasonable time variation. Temperature within a work chamber should be held within ±5° F. from the desired nominal. After the required soak at temperature, a load should be permitted to cool normally in air. Type of furnace for artificial aging is not extremely important so long as live steam never contacts the work.

* * *

TO detail the specific uses to which aluminum has been and is being put would require many pages. The main applications of aluminum are familiar to most of you, and it is believed that a listing of the main characteristics of each alloy will furnish a guide for the selection of alloys for new and also present uses. This list is shown on Table V:

* * *

A few words are in order regarding those alloys whose corrosion resistance is not specifically mentioned. All aluminum can be classed as corrosion resistant, but some alloys are more resistant than others and therefore find particular application where maximum corrosion resistance is important. It is these alloys which have been noted in the previous listing.

* * *

TABLE V

COMMON ALLOYS		CHARACTERISTICS
E. C. and high purity	—	High electrical and thermal conductivity; high reflectivity; excellent resistance to corrosion and chemical attack.
2S	—	Low cost; low strength; excellent formability, corrosion resistance, and weldability.
3S	—	Similar to 2S but has higher strength.
43S	—	Low melting point alloy useful for welding rod.
52S	—	Medium strength; good formability; excellent corrosion resistance especially in salt solutions; weldability not as good as 2S and 3S.
56S	—	Mainly a fine wire alloy; high strength; good formability; corrosion resistance same as 52S.
STRONG ALLOYS		**CHARACTERISTICS**
11S	—	Free-machining screw-machine stock alloy; good mechanical properties.
14S	—	Used for forgings and structural shapes; extremely high hardness and strength; mechanical properties in "W" temper same as 17S-T; resistance to corrosion same as 17S-T.
A17S	—	Medium strength alloy used for rivets; rivets can be driven in "T" temper.
17S	—	General purpose high strength alloy requiring no artificial aging; good resistance to most types of corrosion; good machining alloy.
R317	—	Free-machining high-strength screw-machine stock alloy; properties same as 17S.
18S	—	Forging alloy used for pistons and engine parts; good strength at high temperature.
24S	—	Same as 17S but higher strength; not generally used for machining.
25S	—	General purpose forging alloy; mechanical properties same as 17S but forges more easily; corrosion resistance not as good as 17S.
32S	—	Forging alloy with low coefficient of expansion; good corrosion resistance; good strength at high temperature.
A51S	—	Forging alloy — most easily forged; yield strength higher than 17S; corrosion resistance same as 17S.
R353 (53S)	—	Good formability; medium mechanical properties; good weldability; excellent corrosion resistance.
R361 (61S)	—	Same as 53S, but better formability; higher yield strength than 17S.
63S	—	Extrusion alloy similar to 53S but having lower strength; excellent finishing characteristics.
R301	—	A clad sheet and plate product; mechanical properties same as 14S-T; excellent corrosion resistance; good formability.
75S	—	Very high strength; good corrosion resistance.

IT is hoped that this general and by no means complete discussion of the properties, heat treatment, and general characteristics of wrought aluminum alloys will be of assistance to those who are using or are contemplating using this light metal. Many of the companies represented in the Wire Association are drawing large quantities of aluminum wire at the present time, and are finding this easy-to-work metal to be extremely versatile. Aluminum has truly taken its place beside steel and copper as a metal for wire manufacture.

The Wire Association is for the specific purpose of improving production methods. It has been organized as a clearing house of ideas on technical problems and research work in all phases of practical wire drawing and wire working.

The inquiries discussed were received from and answered by members of the Wire Association. These inquiries are sent to the Secretary of the Association who acts as a central clearing point, and neither the names of the firms, nor individuals sending the inquiry, nor of the men or firms replying are divulged without permission.

STEEL WIRE

by MAURICE BONZEL

* * *

Translated and Published by

Kenneth B. Lewis
Consulting Engineer

* * *

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* * *

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* * *

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Besides being profusely illustrated, there are many reference tables providing much useful data. An effort has been made to treat every phase of the subject in a practical and helpful manner. If you are making diamond dies or tools, or using them, you cannot afford to be without this book.

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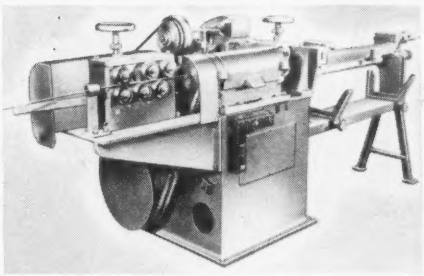

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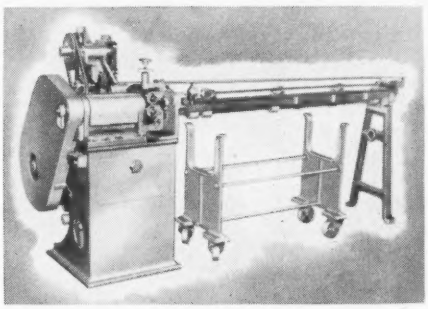

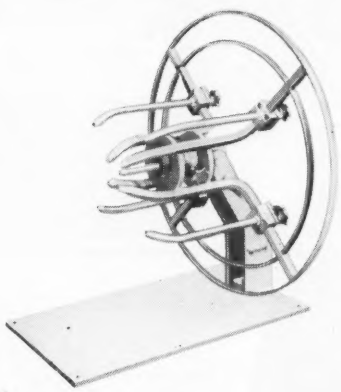

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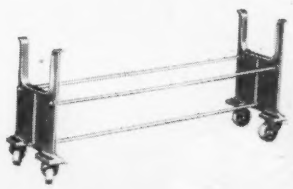

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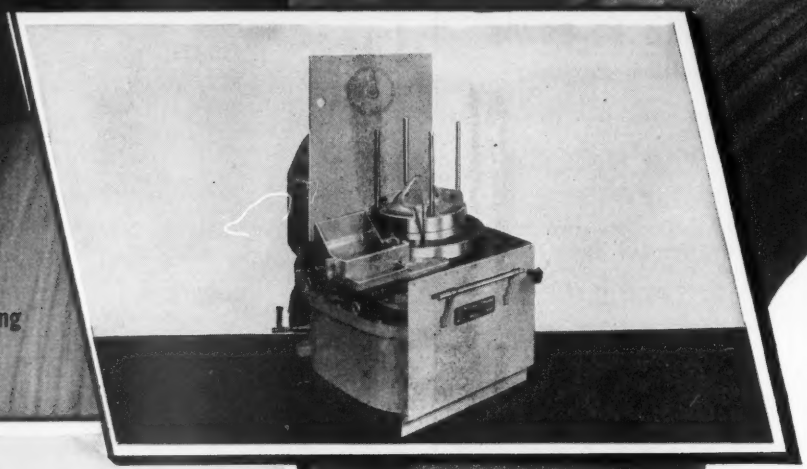
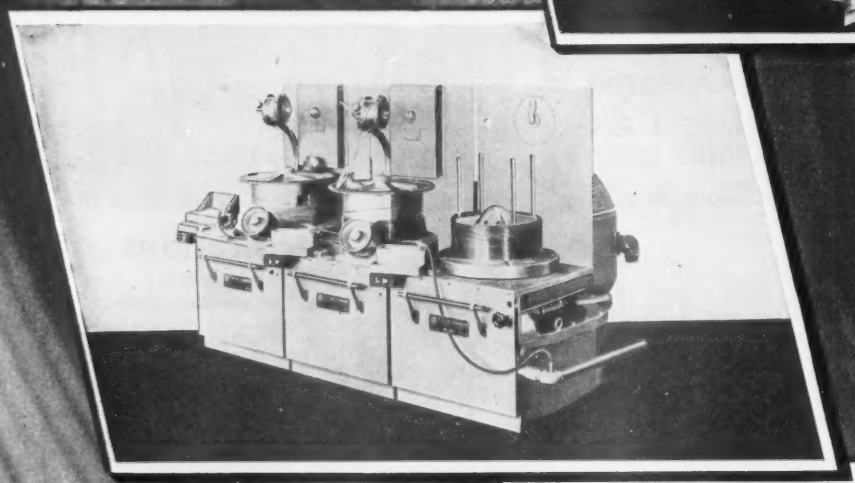
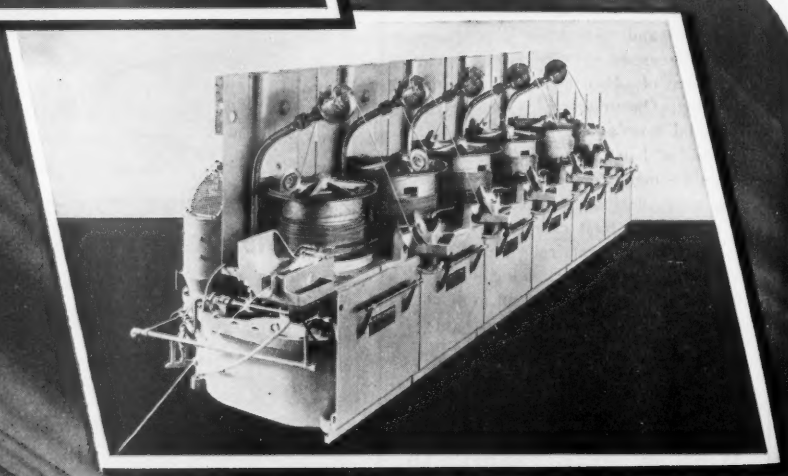


Aetna Single Unit Wire Drawing Machine



Aetna 3-Unit Continuous Wire Drawing Machine



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rd Vertical Wire Drawing Unit...

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Aetna-Standard introduced the first Aetna Unit wire drawing machine in 1938. The many Units in operation over the past nine years have proved the operational and design advantages. The wire drawing industry has recognized this machine as an efficient, cost-cutting production tool.

The applications of this Unit, with the overhead take-off system, offer many diversified adaptations. A wide range of draft reductions can be utilized.

Easy to operate, the machine becomes fully automatic in operation. The Units will run automatically and continuously as long as a continuous strand of rod or wire is being supplied.

Heart of the automatic operation of two or more Units in tandem, centers in the automatic rheostatic synchronizing control, which automatically synchronizes block speeds to compensate for the elongation of the wire through successive drawing dies.

The Aetna unit has proven to be a major development in wire drawing machinery, as indicated by the following salient features:

SIGNIFICANT ADVANTAGES AND FEATURES

1. Compactness and sturdy construction with vertical block and vertical motor on each unit.
2. Unit parts can be interchanged.
3. Vertical motors easily accessible and interchangeable.
4. Controlled, effective water-cooling of blocks and dies.
5. Practical versatility by tandem combinations of two or more Units of the same or different size.
6. Full speed range of each Unit motor always available with the unique rheostatic synchronizing control mechanism.
7. Automatic control of reserves of wire on intermediate Units, offers these advantages:
   (a) additional cooling time and effect between drafts.
   (b) eliminates peripheral slippage of wire on blocks.
   (c) broken intermediate wires can be welded easily.
   (d) reduces wire breakage during starting or acceleration.
   (e) avoidance of extreme sensitivity in auto-rheostatic control.
8. Insurance against obsolescence—Aetna Units can be regrouped by addition of single Units, multi-Units or divisions of multi-Units to keep pace with future wire production or market demand.

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UNIT SIZES AND CAPACITY RATINGS

The Aetna Unit now comes in four sizes for the production of heavy, medium and light gauges of wire.

Unit Size & Designation	Nominal Max. Die Pull Cap.	Nominal Max. Motor Rating	Block Diameters
30" Aetna Unit	16,000 lbs.	75/100 H.P.	22"-30"-26"
22" " "	8,000 lbs.	50/60 H.P.	16"-22"-26"
16" " "	4,000 lbs.	25/30 H.P.	12"-16"-22"
12" " "	2,000 lbs.	10/15 H.P.	12"-16"

With these four Unit sizes and capacities, and with five standard block sizes, it is possible to select the most effective combination of Aetna Units to perform any practical multi-draft wire drawing schedule with any ferrous or non-ferrous material which can be continuously cold drawn without process annealing between drafts.

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Reports from

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Belgium	Czechoslovakia	India	South Africa
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A Symposium Arranged By

Dr. F. R. Morral, Metallurgist, American Cyanamid Co., Stamford, Conn.

BELGIUM

By A. Boddaert, Engineer
Clouterie & Tréfilerie Des Flanders
Gandbrugge

and

Fr. Reyntjens, Engineer
Tréfeleries Léon Bakaert
Zwevegem

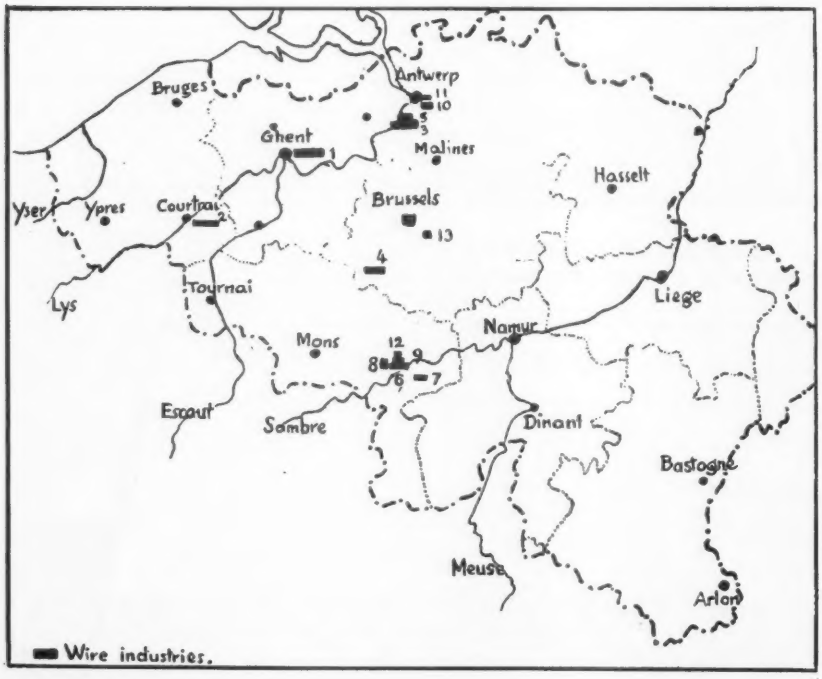
WE find traces of the iron industry in Belgium as early as the XVI° century.

* * *

AT the time the forged iron lumps were "split" by two iron rolls of 10" diameter, driven by the small waterdams in the valley of the rivers Sambre and Meuse round Charleroy, located in the south half of the country where coal and ore were available. A splitting yard (fenderie) was producing 1300 to 1500 lbs of iron rods a day with 8 to 10 workmen. Up to the XIX° century the nail making business remained a family industry in this part of the country.

* * *

IN the early part of the XIX° century following the first U.S.A. patent of Joseph Perkins in 1799, the nail machine put an end to the handmaking of nails and the first nail works were founded in 1833 in the district of Charleroy, and a few years later in other parts of the country. At the end of the first world war in 1918, some of the works got located near the ports as the wire works were exporting nearly 75% of their total production.



IT should be noted that Belgian production of soft steel is chiefly Bessemer Basic, commonly called THOMAS-steel, owing to the high phosphorus contents of the ore and pig-iron, and considering the fact that this conversion process needs no fuel.

* * *

THE rods are rolled either on Garett or on Morgan mills and delivered in bundles of 100 to 300 lbs, spooled on 24" blocks.

* * *

SULPHURIC acid 60° Bé is chiefly used for pickling and sulfate recovery plants are compulsory as the works are not allowed to let their waste pickling liquor run in the small rivers or the town's sewers.

* * *

THE industrialization of the Belgian Wire Industry has been developed to an extremely advanced degree, as according to official figures given to the Ministry of Economic Affairs, the total yearly capacity of the Belgian Wire Works is estimated at some 684,000 tons.

* * *

THE program of these Works covers the whole range of wire and wire products:

—**all sizes and qualities of bright, annealed, galvanized, tinned, painted wire, etc.;**
—**all types and sizes of nails, staples, brads, tacks, hobs, rivets, screws, bolts, etc.;**
—**all the different types of barbed wire;**
—**hexagone and diamond netting;**
—**welded mesh fabrics;**
—**poultry, ornamental and field fence;**
—**all parts for spring bed and mattresses as bedsprings, helicals, hooks, rings, etc.**

(*Please turn to page* 849)

THE BRITISH STEEL WIRE INDUSTRY

By Reginald Smith Brown, M.B.E., Rylands Brothers, Ltd., Warrington, England.

History and Location

RECORDS of early wire manufacture in Great Britain reveal a wide distribution of small groups of craftsmen as might be expected from the historic association of wire with the production of woollen goods.

* * *

COINCIDENT with the segregation of the woollen industry to Yorkshire and the growth of water power, the manufacture of steel wire for carding developed apace in the same area and today Yorkshire represents an important, although by no means exclusive, source of supply of high grade wire associated with the high carbon patented steel process.

* * *

AT a later date, wire manufacture sprang up in Lancashire, first in Warrington probably due to the demands of the watch and clock industry situated close by. The proximity of puddled iron forges undoubtedly led to the expansion of iron wire manufacture and with the advent of the steel process this rapidly developed into the important mild steel wire and wire products industry which is so closely associated with Lancashire manufacturers. Mention should be made of the pioneer work carried out in Lancashire in connection with wire rod rolling mills and the hot dip galvanizing process, that of Bedson being unique.

* * *

Production and Growth

THE steady expansion of the industry since 1913 is shown by the following graph, compiled from figures supplied by the British Steel Wire Industries Association. It will be seen that production has more than doubled in 34 years. The curve shows the unmistakable influence on production facilities attributable to the introduction of the tungsten carbide die, as well as the marks of historic events.

Present Position

THE present overall demand is a source of considerable embarrassment and order books are full for many months ahead. The wire industry, in common with others, has suffered from an acute shortage of raw materials, which will have repercussions on many other products manufactured wholly or in part from wire.

* * *

A shortage of skilled and semi-skilled labour has, in some areas, failed to offset the reduction of rod supplies but the industry has been fortunate in a freedom from those strikes of operatives which have troubled other sections of the community.

* * *

IT would be bold to prophesy the future trend in this country but one might venture to suggest that given an adequate production of coal and a considerable relaxation of Government controls, the industry is well organized and equipped to deal with all normal demands.

* * *

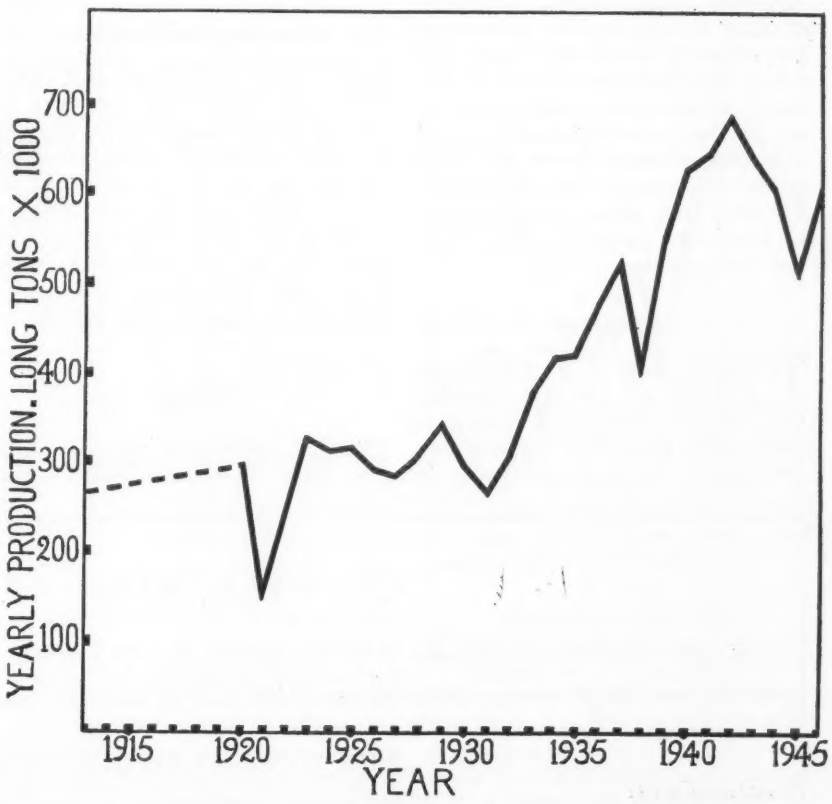
Outstanding Developments

THE wire industry has been steadily overhauling methods of production on sound technical lines and a survey of conditions elsewhere during recent years has shown that it is abreast of modern developments. Points of interest can be summarized as follows:

* * *

Wire Drawing

IMPORTANT manufacturers have developed and constructed their



own machines on robust and productive lines. Attention has been given to lubrication for continuous drawing. Dry soap drawing is practiced down to sizes as small as 0.008" but soap-cum-wet drawing is under review for special purposes demanding clean finishes.

* * *

STRIPPING weights of coils have increased from 450-lb. to 1100-lb. in at least one large integrated plant and coils of 2240-lb. in weight are in vogue for sizes round 8 I.S.W.G. and thicker. Billet weights for these large plants are 440-lb. and endless wire production by welding is common for all operations.

* * *

Galvanizing

THE outstanding development has been the introduction of electrodeposition. Two large plants are operating the Tainton process, making a feature of depositing a heavy coating prior to drawing to size. British Standard coatings are considerably heavier than those normally employed in U.S.A. and no difficulty is experienced in plating coatings of 2-oz. per sq. ft. or more for drawing down to 0.8-oz. and 1.0-oz. An important feature is the large quantity of small sizes of patent steel wire, electrogalvanized after patenting and drawn 80% total reduction or more with full weights of coat. One plant is galvanizing in line with patenting and others are contemplated.

* * *

Patenting

THERE has been a widespread adoption of furnaces burning city gas and isothermal cooling is featured by more than one operator. Progress is likely to be made in bright patenting, and pickling in line to produce coils ready for the mill is similarly foreshadowed.

* * *

Annealing

BOTH inverted bell and Grünewald type equipment has been extensively installed, the former using burnt city gas or the burnt regenerative ammonia system for protective atmosphere. The latter gas seems capable of producing bright annealed wire with the highest quality finish and methods of avoiding decarburization of high carbon wires and bolt stock have been successfully worked out. Research on spheroidising has resulted in a material improvement of output and quality.

* * *

Tinning

ATTENTION to finish of drawn and annealed wires together with accelerated methods of pickling bids fair to eliminate much of the messy nature of this operation.

* * *

Manufactured Products

NETTING, barb, fence and ropes have shown little tendency to change but the manufacture of nails has been completely reorganized by the setting up of the new mill in South Wales and the complete rebuild of the large Warrington factory not yet in production. The latter will incorporate some new features of considerable interest.

* * *

Testing

RAPID methods of tensile testing have been developed using dial reading multiple lever machines of high sensitivity and low inertia. Torsion testing has been mechanized and one ingenious machine has self-tightening grips which enormously simplifies operation.

* * *

MAGNETIC sorting devices and crack detectors are finding increasing use but some emphasis is being placed on surface examination by deep etching for certain products. Hardenability tests have recently been introduced for heat-treatable bolt stock.

* * *

Handling

RAM trucks are replacing earlier methods of handling by overhead tram-rail, etc., and the newer wire mills have been laid down with very adequate free floor space for ease of maneuver. The spaciousness of some of these large shops marks a revolutionary change in wire mill design.

* * *

Research

ALTHOUGH the larger organizations maintain research facilities for domestic problems, the industry has set up a **Wiredrawing Research Committee** under the aegis of the **British Iron & Steel Research Association**, to deal with work of a more fundamental nature on a co-operative basis.

* * *

THE Committee, representative of both industrial and academic interests, under the Chairmanship of **Lt. Com. G. K. Rylands, O.B.E.**, is now getting into its stride and an ambitious programme of work has been outlined.

TO WIRE MILL MEN

Have you considered joining the Wire Association? You are cordially invited to become a member. Dues are $15.00 *a year, which includes a subscription to WIRE & WIRE PRODUCTS and a copy of the Annual Buyers Guide.*

THE WIRE ASSOCIATION

300 MAIN STREET STAMFORD, CONN.

THE COPPER & COPPER ALLOY WIRE INDUSTRY IN GREAT BRITAIN

By G. W. Preston,
General Manager
Copper Development Association
London, England

IN general for several years past the demand for copper and copper alloy wire has been greater than the industry has been able to meet, even when in full production. Although recently there have been no important stoppages of work due to labour disputes in the industry, production has unfortunately, for much of the time, been curtailed by shortages of materials, power, fuel and skilled labour.

* * *

COPPER alloy wire production during the past five years has been as shown below in Table A. Unfortunately comparable figures for copper wire production are not available since the published figures given below include a small proportion (probably less than ten percent) of rough rolled high conductivity strip. Cadmium-copper wire is in this instance included as copper wire.

* * *

AS a typical break down of the figures for alloy wire the following for 1946 may be quoted:

Brass	29.1	Million pounds
Bronze	5.08	" "
Nickel Silver	1.00	" "
Cupro Nickel	0.65	" "
Others	0.18	" "

FEW manufacturers of copper wire cast their own wire bars and there are only two plants which do this to any large extent. For cadmium-copper and other alloy wire production a number of plants produce their own cast shapes.

* * *

COPPER hot rolled wire rod production is in the hands of about seven manufacturers of which five also roll cadmium-copper. All but one of them draw wire. A small quantity of copper wire rod is imported. There are in addition at least twenty-eight firms who draw copper wire either from hot rolled wire rod, purchased from the above sources, or from wire about 0.036 or 0.048 inch diameter which they draw down to finer sizes.

TABLE A
Wire output — millions pounds

	1942	1943	1944	1945	1946	1947 (6 months)
Copper	380	348	316	313	390	200
Copper Alloy	36.4	35.8	28.8	27.9	36.0	18.5

THERE are over thirty firms producing copper alloy wires, excluding cadmium-copper mentioned above.

* * *

OTHER than the copper and the alloy wire producers already mentioned there are a few producers of special alloy wires such as beryllium-copper and chromium-copper but the total production is relatively very small.

* * *

OF the output of copper and cadmium copper wire mentioned above, by far the greater proportion is copper but it is not possible to state accurately what the output of cadmium-copper is, though almost certainly it is at present considerably less than it would be if it were not restricted by a shortage of cadmium. As a very rough estimate the output for 1946 may have been of the order of fifteen million pounds. The alloy usually contains about 0.6 to 0.9 percent of cadmium and is extensively used for electrical overhead power line conductors and trolley wires, while it has almost completely superseded tin bronze wire for telegraph and telephone overhead line purposes.

* * *

Standard Specifications

WAR time conditions, including a restricted choice of raw materials and the need for maximum output, rendered it increasingly difficult to meet all the requirements of some of the more stringent standard specifications. There is now some indication that certain relaxations then introduced into the specifications may be retained. For example the maximum permissible resistance of all cadmium-copper and bronze wires for electrical purposes was increased by 5 percent and the minimum ultimate tensile strength reduced by 2 percent. Even so, some of the specifications are still exacting. For example in one instance an 0.05 inch diameter cadmium-copper wire is still required to have a resistivity not exceeding 1114 ohms (mile pound) at 68°F. with a tensile strength not less than 100,800 psi.

* * *

SOME standard copper wire requirements are also not easy to meet and it is now customary in such cases to use as far as possible vertically cast or scalped wire bars. In particular this facilitates compliance with twist test requirements in which, as a typical example, a wire of 0.137 inches diameter for telegraph or telephone purposes, having a tensile strength of not less than 64,100 psi., must show no surface defect with at least 30 twists in 6 inches. As in the U. S. A., V.C. or scalped bars are also used for fine wires.

* * *

THE standard specification for copper electrical overhead power line conductors, both single wire and stranded, has recently been revised to reduce the number of different standard sizes of conductor from twenty-eight to sixteen, resulting in a reduction of the number of sizes of wire required from twenty-eight to fourteen.

* * *

Production Technique

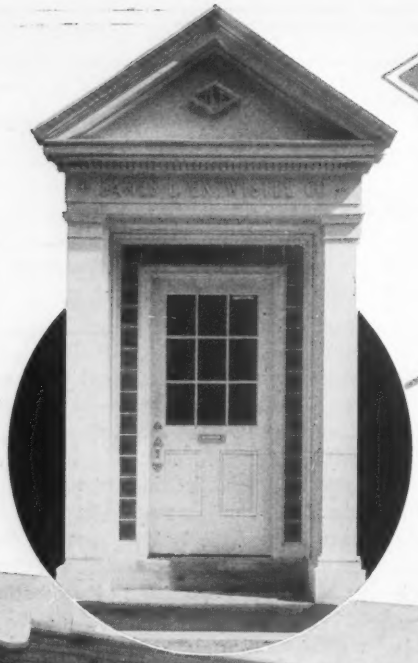
FOR the most part copper and copper alloy wire production in Great Britain follows orthodox lines and there are few, if any, developments which are not common to other countries. Individual manufac-

(*Please turn to page* 850)

JLE

Celebrates

BEGAN AS SMALL MACHINERY TO



With the completion of extensive additions and improvements in office and plant on June 25th, the James L. Entwistle Co. marked another of the progressive steps that have made them the World's largest manufacturer of Wire Machinery and Spark Testing equipment! Some of the many office and plant improvements are shown here.

Office of James L. Entwistle

New Executive Offices

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The A. R. Williams Mach. Co., Ltd.
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JAMES L. ENTWISTLE CO.

43 CHURCH STREET, PAWTUCKET, RHODE ISLAND

World's Leading Manufacturer of Spark-Testing Equipment

Another Important Milestone!

L CONCERN IN 1918—NOW SUPPLIES WIRE
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General Engineering Co., Ltd.
Bury Road, Radcliffe,
Lancs., England

THE NON-FERROUS WIRE AND CABLE INDUSTRY IN CANADA

By H. D. Short
Electrical Engineering Department

Canada Wire & Cable Co., Ltd
Toronto, Ontario, Canada.

THE growth of the non-ferrous metal industry in Canada during the last few years can perhaps be most appreciated from a single example taken from the records. The production of **aluminum** reached a peak of 495,600 tons in 1943 and during the war years this one industry alone furnished almost 40% of the combined Allied requirements of this metal: at the present time the production is at 75% of the wartime level 85% of which is being sent abroad.

* * *

DURING the war years Canada produced 810,000 tons of **nickel.** (an amount equal to 80 to 85% of the total Allied needs) 1,800,000 tons of **copper,** 1,600,000 tons of **zinc,** and 1,300,000 tons of **lead** — 76% of the total of which was exported. The above quoted figures of copper production is approximately 78% of the world's mine and smelter production in 1938.

* * *

TABLE I
MANUFACTURING FACILITIES

Number of Copper Refineries	2
Number of Copper Rod Mills	2
Number of Aluminum Rod Mills	1
Number of Wire Drawing Plants (or divisions of the wire and cable making plants)	7
Number of Plants making Insulated Electrical Wires and Cables	9
Number of Plants making Bare Electrical Wires and Cables	7
Number of Copper Alloy Rod Mills	2

TABLE II

Production of the Chief Non-Ferrous Minerals in 1945 & 1946		
	1945	1946
Copper	474,914,052 lbs.	371,085,000 lbs.
Nickel	245,130,983 "	190,811,179 "
Lead	346,994,472 "	354,444,076 "
Zinc	517,213,604 "	471,833,000 "
Tin	849,983 "	874,000 "

TABLE III

Production of the Chief Non-Ferrous Minerals for the First 4 Months of 1947	
Copper	140,471,444 lbs.
Nickel	76,663,495 "
Lead	105,124,657 "
Zinc	137,359,854 "

TABLE IV

Value of Canada's Total Mineral Production for 1946	
$509,000,000 approx.	
Metallic Mineral Production of Canada	
For Some Significant Years	
1933:	$147,015,593
1941:	393,346,581
1946:	304,736,412

TABLE V

Materials used in manufacturing in the Electrical Apparatus and Supplies Industry relative to the Non-Ferrous Wire and Cable Industry	1944	1945
Aluminum Rods and Bars	198,592 lbs.	818,682 lbs.
Brass " " "	5,451,457 "	3,769,744 "
Bronze " " "	77,170 "	265,749 "
Copper, Rods	44,254,722 "	48,683,162 "
Wire, bare	12,363,727 "	18,610,914 "
Wire, enamelled	2,596,881 "	3,158,716 "
Lead (pure pig)	24,446,707 "	31,326,649 "
Rubber, Crude	43,598 "	21,383 "
Silk, Artificial	30,804 "	30,850 "
Silver	11,112 Troy oz.	15,932 Troy oz.
Tin	91,491 lbs.	1,164,009 lbs.
Zinc, ingots & bars	3,493,108 "	3,141,775 "

TABLE VI

Production of Electrical Wires and Cables	Selling Value at Works	
	1944	1945
Copper, bare	$ 3,792,061	$
bare, including copperweld and trolley wire		5,236,332
copperweld-copper composite and C.C.S.R.		332,518
Brass & bronze wires & cables		387,242
Weatherproof wires	1,484,510	2,255,077
Rubber insulated, braided	6,013,047	
Type R, RP, RH, RW, high voltage, aircraft, automotive, plain R.C., service entrance, all other R.C. types		3,750,639
Thermoplastic wires & cables (except telephone types)		1,898,594
Cambric Insulated, braided	153,395	241,669
Rubber Insulated, leaded	1,005,022	1,344,529
Cambric Insulated, leaded	247,640	309,244
Paper insulated leaded power cable	484,786	321,675
Paper insulated telephone cable	960,630	2,438,617
Rubber insulated telephone	431,657	
Rubber & PVC insulated telephone		664,222
Flexible Cords (except telephone and switchboard)	1,223,805	1,893,912
Armoured Cable	1,175,366	
Flexible Armoured (AC & ACL)		977,672
Signal & Control Cable	52,701	
Signal & Control Cable (non-leaded)	$	$ 25,000
Tape & Wire Armoured Cable (all types of insulation)		474,125
Non-Metallic Sheathed Cable	1,099,706	1,691,825
Magnet Wire, enamelled	2,655,914	3,153,662
all others	927,008	1,400,788
All other Wires & Cables including Aluminum	9,832,029	
Asbestos Insulated (all types)		231,746
Cord Assemblies		326,879
All other Wires & Cables including Aluminum		6,841,259
Total	$31,539,277	$36,241,676

HE production of magnesium was a war development beginning September 1942; from this time the middle of 1945 a total of ,018,162 lbs. was produced. All this metal was produced at aley, Ont.

* * *

ALMOST all of Canada's nickel production and close to 50% its copper is obtained from propties in the Sudbury (Ontario) rea: most of the balance of copper ming from the Noranda deposits Quebec, and other deposits in katchewan, Manitoba, and Britn Columbia.

* * *

ANADA's production of copper during the last 10 years ranged m a low of about 211,000 tons 1936 to a high of 328,000 tons 1940.

* * *

CANADA has two copper refineries, one at Copper Cliff, Ontario, being the largest in the British Commonwealth, and one at Montreal East; a lead refinery and a zinc refinery at Trail, B. C., a zinc refinery at Flin Flon, Man., and a nickel refinery at Port Colborne, Ont. In addition the industry supports an extensive research organization. At least two of the cable makers have comprehensive research and testing laboratories.

* * *

THE magnitude of operations of the non-ferrous wire and cable industry may be appraised from the following appended statistics, which owing to restrictions on publication under war conditions, does not include figures for these years.

* * *

BASED upon an index of 100 for the year 1937 the general industrial activity at the end of April 1947 for all of Canada was 157, a record for peace-time.

* * *

ALTHOUGH the overall production of base metals declined somewhat in 1946 it should be noted that Canadian industry has been so greatly enlarged and diversified since 1939 that it now requires a very substantial portion of its own metal production — for example, about 40% of its copper, and about 33% of its lead and zinc. Since somewhere in the neighbourhood of 20-30% of the copper used goes into electrical products of all kinds (which of course need wire and cable) and around 10% into wire and rods, some idea of the growth of the non-ferrous wire and cable industry since the pre-war days presents itself.

* * *

BRIEF REPORT OF THE ERROUS WIRE INDUSTRY IN CANADA

By L. H. Doering
Manufacturers Wire Division

The Steel Company of Canada, Ltd.,
Hamilton, Ontario, Canada.

N reviewing the part played by the Canadian Wire Industry dur- g the reconversion period, it is pparent that the problems are very milar to those experienced by nited States' mills.

* * *

WITH Industry in Canada operating at a near capacity level, unprecedented demand for Wire Products prevails, which continues to tax Wire Mill capacity.

* * *

WIRE order backlogs, which are thought to contain little in the way of fictitious tonnage are commencing to fall off gradually, but it will likely be a considerable time before pressure for delivery subsides. There have been scattered reports of resistance to high prices for consumer goods, particularly in the Furniture and Bedding Industries, but any cancellations of Wire Product orders which may result, will only help to reduce mill backlogs. Merchant lines, including Nails, Bale Ties, Fencing, Barbed Wire and Posts remain very tight.

* * *

THE marked increase over prewar years achieved by Canada's Steel Ingot production, which approximately doubled prewar figures, was not recorded for Wire Rods. However, production has been maintained well above prewar levels despite and overall scarcity of steel. It is conceivable that the shortage of scrap may force a curtailment of steel production during 1947, which may further affect Rod supplies.

* * *

TOTAL production of Wire Rods in 1945 was 258,260 net tons, compared to the average for the ten prewar years 1929 to 1939 of 160,-904 tons. During the summer of 1946 strikes in the Canadian Steel Industry were responsible for reducing the tonnage to 212,637 tons for the year. It is expected 1947 will see a record tonnage produced.

* * *

THERE are two continuous Wire Rod mills in Canada, one operated by **The Steel Company of Canada Limited,** at Hamilton, Ontario, and the other by the **Dominion Steel and Coal Corporation Limited,** at Sydney, Nova Scotia. All Wire Rods produced are Basic Open Hearth.

* * *

NOTWITHSTANDING the fact that the per capita consumption of Wire Products in Canada is well below that of the United States, the Wire Industry in Canada has made considerable progress during the past decade and is continuing to make extensive installations of modern continuous drawing and other complimentary equipment. Probably the most marked advances have been in the High Carbon Specialty Lines, including Rope Wire, Tire Bead Wire, Oil Tempered Spring Wire and Core Wire for Aluminum Cables, etc. Continuous research in this and other fields of Ferrous Wire production is being undertaken with a view to providing Canadian Manufacturers with a complete range of Steel Wire.

* * *

AN outstanding example of achievement is the production of Wire for ropes which previous to 1936 was entirely imported. Canadian made Rope Wire has, in service, proved comparable in every way to imported material, and accounted for a substantial portion of the Wire tonnage used in 1946. Total output of Steel Wire in Canada during 1946, as published by the Dominion Bureau of Statistics was 216,977 net tons, which includes Galvanized, Barbed and other Coated Wires.

* * *

THE following companies are actively engaged in the manufacture and sale of Drawn Ferrous Wire in Canada:

Canadian Steel Corporation, Limited, Walkerville, Ontario
Dominion Steel and Coal Corporation, Limited, Sydney, Nova Scotia
Canadian Tube and Steel Products, Limited, Montreal, Quebec
Graham Nail & Wire Products, Limited, Toronto, Ontario
The B. Greening Wire Co. Limited, Hamilton, Ontario
Frost Steel and Wire Co. Limited, Hamilton, Ontario
Laidlaw Bale Tie & Wire Co. Limited, Hamilton, Ontario.
The Steel Company of Canada, Limited, Hamilton, Ontario, and Montreal, Quebec
Morrison Steel and Wire Co., Limited, Vancouver, British Columbia
James Pender & Co., Limited, St. John, New Brunswick

* * *

THE price of Wire and most Wire Products, from September 1939 to February 1947, increased less than 20%, as compared to the Canadian price index for raw and partly manufactured goods, which recorded a rise of 68% during the same period. The Canadian Government is continuing its post-war policy of gradual decontrol of prices. Screw and Bolt Products are now, for the most part, free from price control, but with the exception of a few items, Manufacturers' Wire and Merchant Products remain under W.P.T.B. directives from Ottawa. It is expected 1947 will see the end of controls on all Wire and Wire Products.

* * *

EXPORTS of Steel can only be undertaken with a governmental permit, and only a very small percentage of Wire produced has been shipped outside Canada during the war years. Canadian Wire imports in 1946 constituted approximately 10% of the Wire consumed, and largely consisted of Rope Wire, Finished Ropes, Wire for Fence Weaving, Spring Wire and Electric Arc Welding Rods. Many specialty Wires which require extensive investment in manufacturing equipment, not warranted by the demand in Canada, are brought in chiefly from the United States. Included in this category would be Stainless Wire, Piano Wire, Music Wire, Cloth Carding and some Shaped Wires.

THE WIRE INDUSTRY OF CHILE

By Juan L. Carrasco, Ingeniero
Departamento de Industrias
Corporación de Fomento de la Producción, Santiago, Chile.

Iron and Steel Wire

THERE are about eight small industries established in Chile of which only three produce wire at present, especially, for the manufacture of nails. These factories are very small in capacity, are very poorly equipped and do not use modern methods.—Their production does not run over 5.000 tons. per year which is less than half the wire requirements for nail in the country.

* * *

THE present average consumption of wire in Chile is approximately 15.600 metric tons. per year including the following types:—black, bright, galvanized, nail wire, screw wire, spring wire, barbed wire, tinned wire, copper coated and wire mesh for fence.

THE demand for wire and wire products is very great and present installations could have produced more than 5.000 tons. a year, but there is a shortage of 1/4" bars. The small production of the 1/4" bars is used mainly in construction work.

* * *

THE most important producer of nails at Santiago, has purchased

from the Morgan Engineering Co. complete modern wire drawing and wire galvanizing equipment to produce from 20,000 to 25,000 tons, of wire per year. Production is to start during the end of the present year.

* * *

THE United Shoe Machinery of Chile has purchased from Morgan Engineering Co. complete wire drawing equipment to produce special nail and tack wire needed for the very special shoe nails and tacks required for their shoe machines. They can produce, annually, approximately 150 tons. of products beyond their iron requirements, which will provide special shoe nails and tacks for local consumption.

* * *

A third industry, which manufactures copper products, is preparing to roll steel wire rod on their rolling mill from billets secured from U.S. and draw it into wire. Production is expected to start during the present year.

* * *

WITH these three plants, the wire production in Chile is expected to be well met without the production of the small, inefficient wire factories.

* * *

THERE is no doubt as to the efficient operation of these plants when placed in production and it is expected to have conversion costs from wire rod to wire and finished products comparable with the U.S. costs.

* * *

WIRE rod will be secured, in the near future, from **"Compañía de Acero del Pacífico"** a new steel industry which is now under construction and which is expected to start operation in 1950, provided everything runs as scheduled.

* * *

THE present steel producing capacity of the country is very limited, around 30,000 metric tons. per year of reinforcing rods. The production facilities are antiquated and of a high cost. Due to this fact the **"Corporación de Fomento de la Producción"** started in 1942 the studies for the installation of a modern Steel Plant in Chile. As a result of such study there is now under construction a plant that will produce 180.000 metric tons. of pig iron and about 150.000 tons. of finished products, including rails, structural steel, construction bars, wire, plate and sheets, cast iron pipes and iron and steel castings. This plant will furnish practically all the present needs of the country.

* * *

Copper Wire and Cables

THE copper wire and cable used in Chile was practically all imported up to 1944. There were five small plants producing only bare copper and bronze wire but not over 1000 tons. per year.

* * *

IN view of the fact that our consumption was above this figure and that could be supplied by a local industry, the **"Corporación de Fomento de la Producción"** in 1942 began to investigate the possibility of obtaining the necessary machinery and equipment in the United States.

* * *

A new Company was organized in 1944 under the name **"Manufacturera de Cobre S. A."** with a capital of $42.000.000.—Chilean pesos, or approximately $ U. S. 1.400.000.—The third of this capital was subscribed by "Corporación de Fomento", a state institution to develop industries in the country.

* * *

NEGOTIATIONS were concluded with the **General Cable Corporation** to acquire from their plant at Pawtucket, R. I. practically all the equipment needed for the installation of a complete wire and cable plant, including a complete rolling mill. The equipment was installed in Chile as a complete plant and has been in production since the beginning of 1945. The Wire and Cable Department has a productive capacity of approximately 3.500 tons. per year. At present it produces all types of light copper bars, wires both plain and twisted, including all the standard trolley types required by the local market, all the standard types of construction wire, as well as waterproof wires of dimensions up to 600.000 units of twisted wire and the most commonly used types of stiff wires.

* * *

THE productive capacity of 3.500 tons/year of the plant is somewhat higher than the amount estimated to cover the needs of the country during the first four years but Fomento's Plan for the Electrification of the country is progressing rapidly and the various sources of increased future demands for the products of the Wire and Cable Department may soon prove inadequate.

THE WIRE INDUSTRY IN GERMANY

Summary from various reports.

SEVERAL reports have been scanned, and some have been briefly reviewed by **Wire and Wire Products.** All these reports have in common the statement that the wire industry in the Russian zone was not visited. The plants and personnel seen were interviewed by British teams, American teams and an Australian team. Some time, when all the reports have been published it may be possible to really get a general picture of the situation in that country at the end of the war.

* * *

IT is not pertinent here to discuss all the phases of the wire industry in Germany, but some of the developments noted by the British team of which John Rigby (member of the W.A.) was a member may be of interest.

* * *

THE question of phosphate coatings was many times discussed and it was found that owing to the poor drawing lubricants used in the war period the BONDOR treatment had been used in at least 3

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Light the Way to

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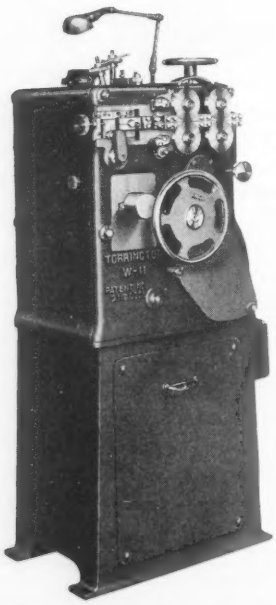
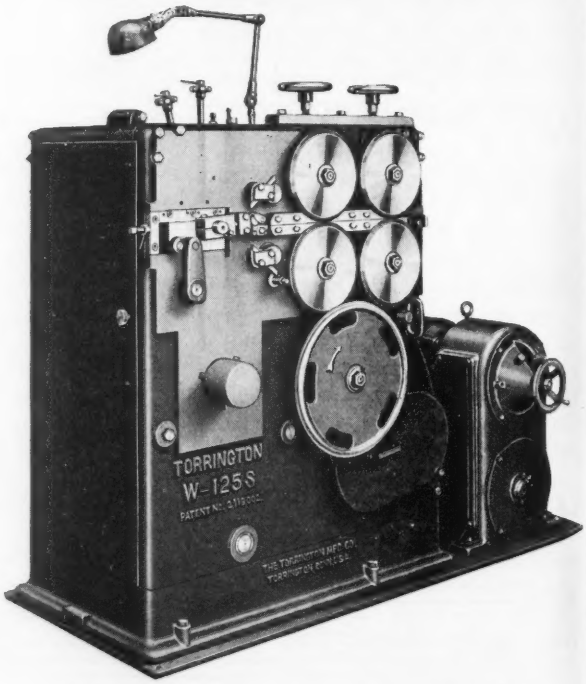
MODEL W-100 Segment Type Spring Coiler, Wire diameter range: .003" to .015". Wire length per spring: 0" to 16". Coil range, outside diameter: 1/32" to 9/32". Springs per minute 50 to 350.



MODEL W-11 Segment Type Spring Coiler. Wire diameter range: .015" to .072". Wire length per spring: 0" to 42". Coil range, outside diameter: 3/32" to 1 9/16". Springs per minute: 23 to 190.



MODEL W-125S Segment Type Spring Coiler. Wire diameter range: .105" to .250". Wire length per spring: 0" to 75". Coil range, outside diameter: 3/8" to 4 1/4". Springs per minute: 13 to 77.

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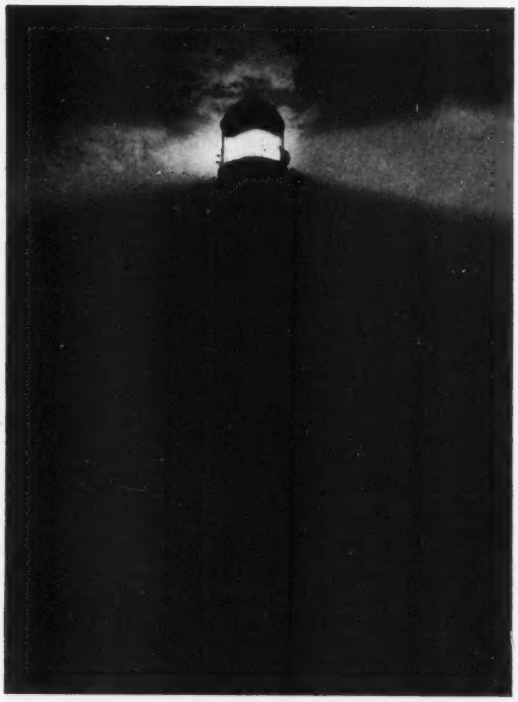
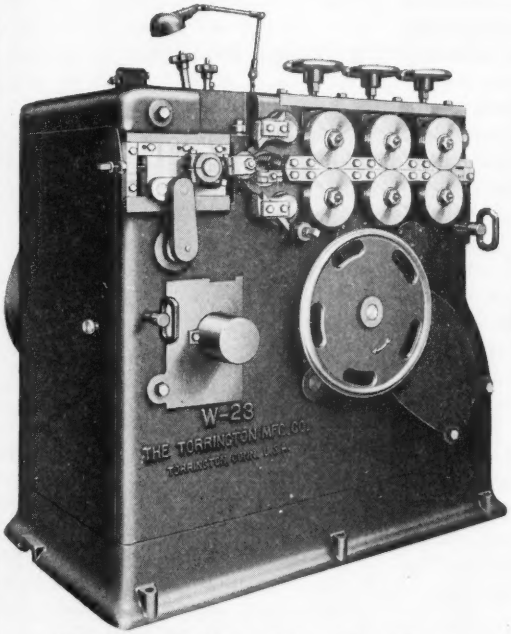
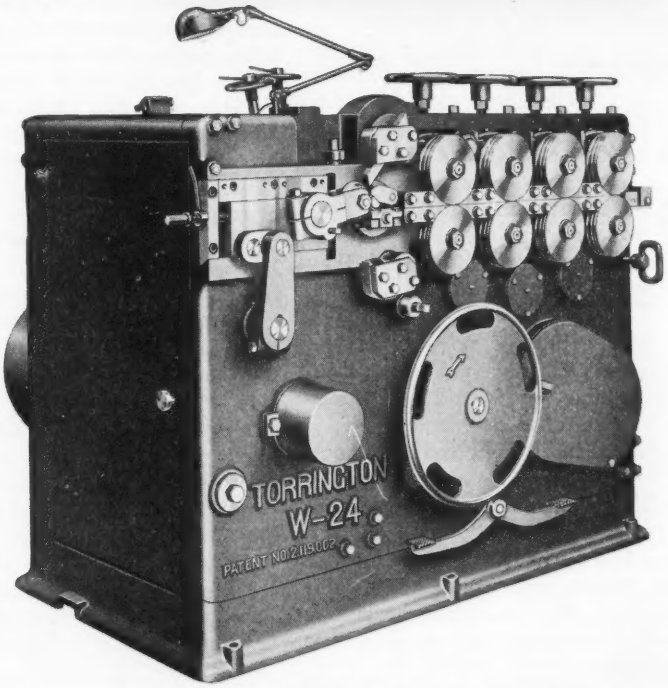




MODEL W-23 Clutch Type Spring Coiler. Wire diameter range: .125" to .312". Wire length per spring: 1.7" to 648". Coil range, outside diameter: 3/4" to 4 1/4". Springs per minute: 2 to 60.



MODEL W-24 Clutch Type Spring Coiler. Wire diameter range: .187" to .500". Wire length per spring: 3.67" to 815". Coil range, outside diameter: 1" to 6". Springs per minute: 2 to 50.

ALL FOURTEEN . YOURS ON REQUEST

Manufacturing Co. Torrington, Conn.

of the factories visited drawing high stress steel wire.

* * *

WIRE is bonderized after pickling in sulfuric acid. For a successful coat the time of immersion was 3 hours and the solution near the boiling point.

* * *

THE bonderized coat was claimed to assist greatly in die life and to eliminate scrap. The wire seen on the machines certainly was of excellent finish but held a dark blue color right to the finishing size on long holing. For brassing tire wire two dips were sufficient. Pnuematic hammers re-used to work harden the steel drawing plates, hammering taking place from red heat until the plate has lost its color.

* * *

SOME mills had converted from single hole drawing to continuous machines of the overhead wap-off type for dry drawing.

* * *

TUNGSTEN carbide and diamond dies were used on the continuous machines but on the single hole blocks were extensively used.

* * *

ONE concern manufactured variable section dies for the production of aircraft stays and they seemed extremely promising.

* * *

IT was generally noted that die angles, etc. were not selected to any scheme or formula, the surface finish of dies was considered in general indifferent and even poor.

* * *

THE German industry had not adopted generally the bell type annealing furnace. Only one furnace was discovered working on this principle, but no atmosphere was used on insulating and the wire was oxidized.

* * *

PATENTING was done generally at low temperature (900-950 C) as was the quenching in either lead (450-500 C) or salt (420-470), scaling was prevalent and the speeds used were about 4 to 6 cwt/hr.

* * *

HOT dip galvanizing units with as many as 50 to 52 ends being processed in a single unit were noted. Various cleaning processes were seen: a) the wasteful coil pickling process; b) cleaning in length, an example being that of soap drawn wire, which was first degreased in hot sodium carbonate solution, water washed, pickled in cold muriatic or hot sulfuric acid, water washed, passed thru a neutral flux and direct into the spelter. c) electrochemical cleaning. Crapo's process was seen used for mild steel when heavy coatings were required.

* * *

ON balloon cable wire only .067 oz/sq./ft. of spelter was found. Only one large electrogalvanizing unit was known to operate in Germany, although a second one was on order. The units made by the **Langbein-Pfannhauser Werke A.G.** consist of an anodic clean, in a sodium hydroxidesoda ash solution at 90 C — the bubbles formed on the anode, the wire, mechanically remove the grease or soap. The wire passes then into a bath of dilute muriatic acid, a water wash, a dilute soda ash solution, "chemically pure" dilute cold sulfuric acid— in which the wire is again made anodic, — water rinse, mechanical cleaning in sand, and then into the plating tank, rinse into clean water, hot water, dry in hot chamber and finally take up in spools. The plating solution is of patented composition, although essentially zinc sulfate at 32°Be. with a pH of 4.8 and is operated at 40-42°C. Zinc plates serve as anodes. The plating cell is about 32 ft. long, the total installation some 200 ft. The electrical supply was 600 amps at 4 volts for cleaning and 2,500 amps at 4 volts for plating. The capacity with .037 in. wire was about 75 tons/month based on a 24 hr. working day. Tin was applied only by hot dipping.

* * *

AN interesting installation was found for hardening and tempering of wire for card clothing, wire healds, etc. and a variation of it was used for strip spring steel. The process consisted of

1. **Removal of drawing lubricants — by molten neutral salts or lead.**
2. **Rinse with water, or hot sulfuric acid (28 Be) in this case followed by water rinse. Dry on hot plate.**
3. **Preheat at 500° C. The wire enters an electric tubular furnace, with various temperature zones. The inside of the tubes was flushed with an atmosphere of producer gas. The tubes were of heat resisting steel.**
4. **Thin tube zone at 800°C.**
5. **Follow in tube into quenching zone, in which the tube was either water or oil cooled.**
6. **Into tempering zone, where the tubes were immersed in molten lead, two zones were maintained, one at 420 and another at 400/380°C, according to the temper required.**

* * *

THE now hardened and tempered wire was passed thru a mineral oil and cleaned with a fine felt wipe prior to getting to the take up frame.

* * *

FOR spring steel wire the rectangular tubes had 3 zones, at 700, 800 and 950 C. The tempering was done in one zone at between 300-450 C.

* * *

IN alloy steel wire Germany made little improvement, although they concentrated on good heat treatment and good cleaning.

* * *

A machine was found that was supposed to measure hardness accurately on rounds from 1/8 to 1/64 in. O.D. In one plant to prevent use of drawing soap for domestic purposes, a dye was introduced into it.

* * *

H. Mucke had done some work on reactive drawing. He hoped to obtain better results by using a P.I.V. variable speed gear to each block instead of using electrical means for varying the speed of the block.

* * *

DURING the war it was necessary to find a substitute for lead. It was found that salts had advantages in that they gave better torsion and bend properties. Further, there was no lead pick up.

* * *

TO accuratly register the drawing die contour, **Dr. Rohn** of **Heraus** had used a plastic die-cast which was easily withdrawn from the die. This plastic cast was presumably of such consistency as to enable him to withdraw and measure the back relief.

* * *

References

BIOS final report No. 1214, items 21 and 31, 1946, 98 pages and 16 figs. J. Rigby et al. German Ferrous Wire Industry.

PB 49242, Steel Wire, J. R. Richards, BIOS trip 1960, Australian Scientific and Technical Mission.

P.B. 49200, German Wire Rope Industry, BIOS, W. & W. F. July '47, p 515.

Some observations on German cable manufacture, R. A. Schatzel, W. W. P. Dec. 1946, p 965-8, 980-5.

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WIRE INDUSTRY IN INDIA

By Sarup Singh Gill

Pitt University
Pittsburgh, Pa.

EXACTLY when Indians started the art of wire-drawing is not known, but recent excavations of two cities in northern India have definitely proved that in the era of 3000-4000 B.C. Indians were quite skilled in drawing ornamental wires. As in Europe, in India too, centuries before, steel wire was made by hammering and finally drawing through dies, but the whole process was done manually and with crude equipment.

* * *

WHEN the European countries during the industrial revolution were changing fast from manual technique to mechanical equipment, the then existant Indian industries were crippled by the foreign dominant government. India was then being converted from an exporting country to an importing country by these foreign vested interests. Most of the indigenous industries soon disappeared and the wire industry was no exception.

* * *

AGAINST heavy odds, the Indian steel industry was initiated in the beginning of this century at **Jamshed-Pur** by **J. N. Tata,** India's greatest enterpriser and most far sighted business man. This was later followed by **Indian Iron and Steel Company** in 1918, at Hira Pur, **Steel Corporation of Bengal** in 1936, at Burn Pur and **Mysore Iron and Steel Works at Bhedravati** in 1930. The figures shown in Table A give a fair idea of the progress of Indian steel industry and a drop in import of steel.

* * *

WITH the development of the steel industry, a small plant—**Indian Steel and Wire Products Company** — with few nail machines, single wire-drawing blocks, and a galvanizing plant was started in Jamshed Pur in 1921. The raw material as No. 5 wire rod was imported from Belgium. Following a change of ownership in 1927, it soon developed into a full fledged wire mill. With the addition of a Garret type rod mill, modern continuous wire machines, patenting furnaces, cold and hot heading equipment and barbed wire machines. The excellent record made by this concern served as an impetus for other enterprising men to start small wire mills in other parts of the country which became quite successful due to the begining of the second World War.

* * *

EXCLUDING all those small manufacturers of wire products, especially nails and screws, etc., which carry on mostly on a cottage industry basis, there are about 29 other wire mills with an approximate annual production of 70,000 tons. Out of these 29 wire mills hardly four or five have their own rolling mills. The **Indian Steel and Wire Product Company** at Jamshed Pur is alone responsible for approximately 66% of the total wire production in India (see Table B) and supplies wire rods to the non-integrated wire mills. Hardly 6 or 7 wire mills have a production over 100 tons a month. Most of these wire mills finish their product as commercial wire, nail screws, bolts and rivets, etc. The **Indian Steel and Wire Products Company** is the only concern that produces galvanized wire, barbed wire and patented wire and hence is a manufacturer of tyre bead wire, spring wire and other qualities of high carbon wires to required local specifications.

* * *

THE raw material, mostly low carbon steel in the form of 2" — 1-3/4" square billet, is supplied by **Tata Iron and Steel Company** and **Steel Corporation of Bengal.** The quantity produced locally today is too low to satisfy the present and future requirement of the country.

TABLE A

INDIA'S STEEL PRODUCTION x 1000 TONS

Year	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943
Production	810	876	880	910	952	1035	1200	1350	1560	1600

STEEL IMPORT (TONS)

Year	U.K.	Germany	France	Belgium	U.S.	Japan	Others	Total
1914	883,600	201,407	2,048	172,386	22,035	.....	.....	1,293,209
1935	184,929	31,788	12,002	89,740	2,646	18,913	.....	373,655
1936	218,760	67,739	15,914	100,586	5,446	25,514	.....	453,666
1937	168,273	48,356	13,280	68,005	3,998	27,287	.....	366,545

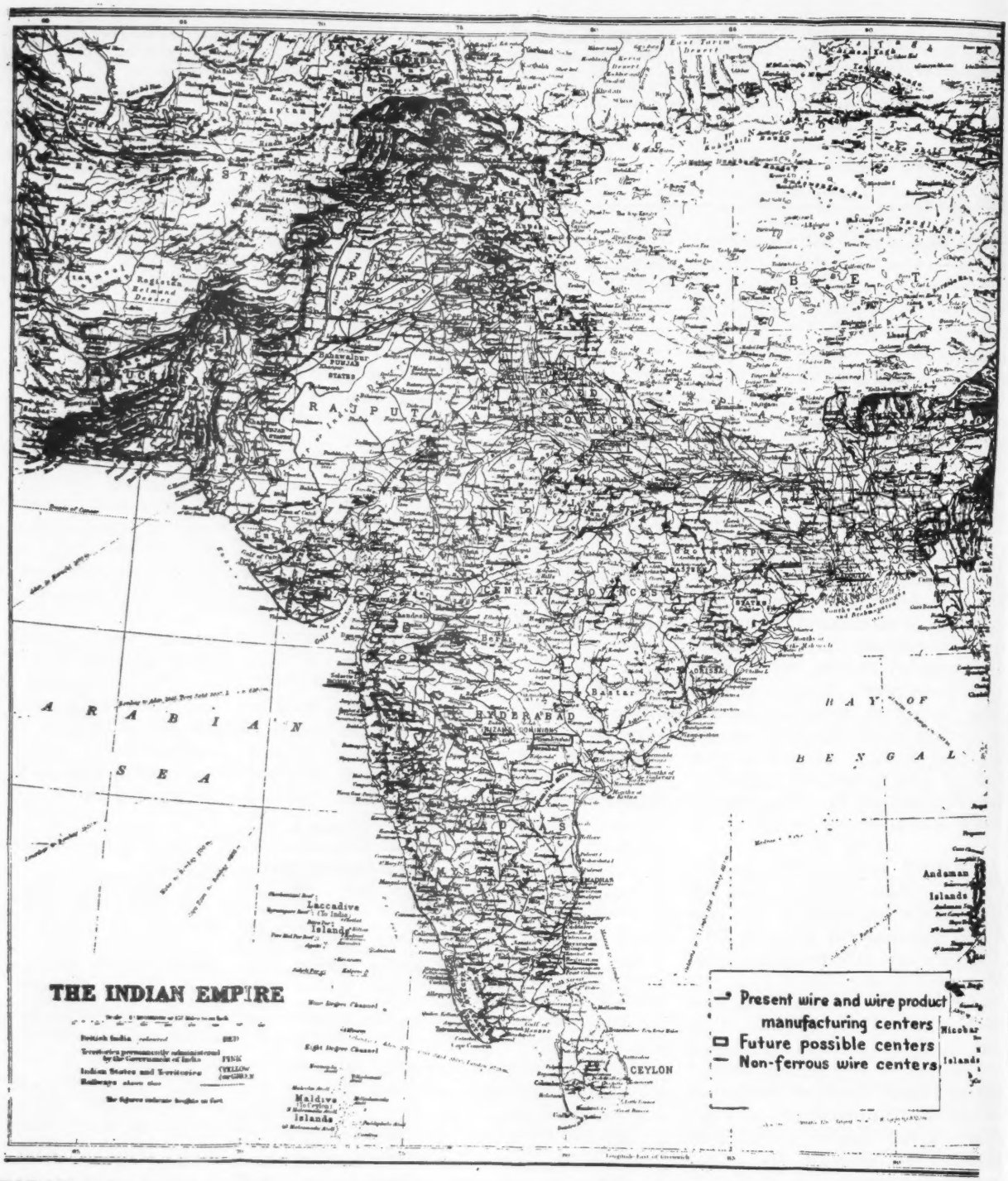
WIRE AND WIRE PRODUCTS IMPORT (TONS)

Year	U.K.	Germany	France	Belgium	U.S.	Japan	Others	Total
1914	3,765	3,364	.....	1,346	1,433	.....	818	10,726
1935	3,789	4,335	119	7,073	100	.....	12,986	28,365
1936	4,530	4,141	5	8,570	28	.....	10,653	27,977
1937	4,663	3,107	507	5,915	41	.....	5,819	20,052
1944	.....	.....	.....	.....	40,000 Approx.	.....	.....	.....

TABLE B

An approximate productive capacity of Indian Steel and Wire products

1. Rods in straight lengths and coils	48,000 tons a year
2. Wire drawing	36,000 tons a year
3. Nails	14,400 tons a year
4. Galvanized and telegraph wires, signal wire	9,000 tons a year
5. Bolts, nuts and rivets (⅝" size)	1,800 tons a year
6. Barbed wire	7,800 tons a year



TODAY, India imports practically 100% of its wire rope, umbrella wire, music wire, hair pins, textile wire, steel pins, small size chains, woven wire fence, screen cloth, shaped wires, fine wires (.048") and major part of all types of springs, nails, bolts, wood-screws, coated and uncoated wire, welding rods tyre bead wire, etc.

WITH a promise of grant of independence to India in June 1948, large expansionist programs for new automobile, air craft, shipbuilding industries, communications, large dams, manufacture of electrical equipment, ropeways and big cooperative farms have already been chalked out, which need wire in all forms and qualities.

BUT for the **Indian Cable Company** at Jamshed Pur and **National Cable Company** in C.P.. the field of non-ferrous and alloy wires manufacture has hardly been touched so far. Gold, silver and other types of ornamental wires are drawn manually all over India on a very small scale.

(*Please turn to page* 851)

THE WIRE INDUSTRY IN SPAIN

By Ramón Quijano de la Colina
Sociedad Anónima "José María Quijano"
Forjas De Buelna
Los Corrales De Buelna
Santander, Spain.

THE most important iron, steel and alloy steel wire concerns in Spain are:

"Alambres de Cadagua" y "Sociedad Franco-Española de Alambres y Derivados, S. A."
"La Industrial Asturiana, S. A."
"Riviere, S. A." (Barcelona).
"S. A. Echevarría" (Bilbao).
"S. A. José María Quijano" (Santander).
The "Sociedad Electromecánica de Córdoba" is the most important copper, brass and bronze wire producer.

* * *

BEFORE 1936 the above iron and steel wire concerns had a capacity of approximately 50,000 tons yearly to be produced from rods, and that was their normal production. Since, there has not been normality in the supply of raw materials for the wire industry production has dropped to some 35,000 tons per year. Coal and scrap are scarce.

* * *

THE national requirements for wire are increasing due to the population increase, raising of the living standard and the progressive industrialization of Spain. The yearly production mentioned above is altogether too low to meet the demand of the market. There is a great deficiency of all kinds of wire and their products, and therefore most of these products are distributed through official channels to avoid the existence of black markets.

* * *

IT is difficult to estimate the present annual requirements for wire and wire products of the Spanish market, but it is estimated at 70,000 tons per year.

* * *

IT is believed that the companies named above have the necessary capacity for rolling rods, and therefore are ready to meet the requirements of the market as soon as the supply of prime material becomes normal. All the concerns mentioned and particularly the larger ones, are modernizing and enlarging their plants looking forward to this future with normal supplies. This is an indication of a firm belief in the future.

* * *

GENERALLY, the executives of the Spanish wire industry have a progressive and enterprising spirit. They wish to incorporate the latest technical developments in their factories. They wish to have contacts with societies and foreign concerns in their business. Considering the limitations of the modest internal market, they try to make interesting experimental investigations. For example: the most important Spanish wire concern, **S.A. José María Quijano,** which produces some 24,000 tons of wire and wire products, experiments at present with the production of ingot iron in electric furnaces. It is desired to resolve the difficult problem of lack of scrap and ingot iron. It must be considered that iron ore is abundant in Spain, and soon there will be available large amounts of electric power. The power plants are being installed at present and should be operating in a few years.

* * *

THE Spanish wire industry is not organized by a system of subdivision of work. It may be of interest to mention that the concern previously mentioned owns their own water falls, open hearths and electric furnaces to produce steel; rolling mills and a complete wire mill installation to produce all kinds of commercial types of wire as well as special types, such as flat wires for card and heddles, electrical resistance wire, wire for tires, wire for tuna fishing, etc. They have several plants where wire products are manufactured; steel rope, springs, nails, netting, fence, welding rods, complete installations for aerial transport by cable and others.

* * *

THIS company has therefore a completely integrated plant, wider and more complex than that of any American plant. If in the future it completes its installation with an electric blast furnace, it would then start with such fundamental raw materials as iron ore and coal and would see them through to the finished wire product.

* * *

THE outlook for the Spanish wire industry can not be better. In 1936 the per capita consumption was only 2 kilos per year (4.5 #). This figure is really small and ridiculous, and that is why a great increase can be expected. A great increase in the above figure should be forth coming as the country is industrialized. A good measure of the Spanish industry is the increase in electrical energy consumption, whose production is definitely being increased with the new water power installations now in construction.

* * *

Wire Products in Spain

FIRST shall be mentioned the products which are most mechanized and whose production can be done on a large scale and therefore are the object of preferred attention by the important concerns of the wire industry, which, as has already been stated, also manufacture the wire they use.

* * *

NAILS, shoe nails, tacks, spikes, and similar articles. In general, these are produced with modern machines. There are however a large number of smaller producers who have some old machines with which they manufacture on the borderline of the official market. In well organized plants the machinery is modern, of German or French origin. Their production schedule is as follows:

* * *

EXTRAFINE nails (1 to 1.5 mm wire) (are produced at the rate of some 520 nails per minute per machine.)

COMMERCIAL nails (approximately 2 mm wire), 420 nails/min. Semi thick nails (2.5 to 3.5 m/m wire), are produced at the rate of 350 nails per minute per machine. The finish and presentation of the nails to the market is excellent.

* * *

STEEL cable. Almost all of this is produced by **"S. A. José María Quijano** and **Sociedad Franco Española de Cables y Alambres".** The first produces at present some 230 tons per month of steel cable, and is expected to soon increase this production by an important amount. Their fishing cables have a good reputation. This concern exports a considerable amount of its production to South American countries. This is believed to indicate a good product, since it has to meet the economic disadvantages due to the greater cost of all raw material in Spain (coal, scrap, ingot iron, hemp, jute, greases) as compared with prices of these materials in other industrial countries.

* * *

THE machines used for the manufacture of cable are usually of English, French or German origin. **Quijano** is building extra heavy machines to extend their capacity in cable production, amongst which will be two closing machines in tandem, which will permit them to make cables weighing up to 18 tons without splices.

* * *

WIRE cloth is produced mainly in Cataluña and Santander provinces, and they produce the whole range of iron, steel, brass, bronze, phosphor bronze, nickel, etc., etc., wire cloth.

* * *

THERE is some national manufacturer of good looms, but most of the looms operating at present are German, from **Jager,** a type similar to that produced by **Mummert-Dixon** in the U.S.A.

* * *

SIMPLE and triple torsion netting. The great producers of these articles are the same as mentioned in the previous paragraph. The machinery used is not too modern, although it is well known that the progress made in design in the last few years, does not give fundamental advantages; only details have been improved. It is difficult to import at the present time, and this machinery can not be replaced.

* * *

WELDING rods (gas and electric), calibrated wire, etc. The importance of these products increases daily. There is a plant prepared to produce 150 tons per month of these products. In welding rod production the immersion system is used in preference to automatic machines.

* * *

BARBED wire. The need of this article is mostly occasional, particularly for war time. The peace time needs are small.

* * *

Summary

IN general the wire industries, or their associated industries, are those which manufacture wire products. There are a few small producers of bed springs, nails and other wire products.

* * *

IT is to be noted that only few American machines for the production of wire products are available in Spain. Other countries have supplied the machinery. American machines are known, however, thru technical magazines. There are good possibilities that Spanish concerns purchase these machines as soon as the world wide trade becomes somewhat normal.

* * *

THE WIRE INDUSTRY IN SOUTH AFRICA

From a report by J. W. Vander Laan & C. B. Welch.

Foreign Commerce Weekly, March 1, 1947

SOUTH Africa's steel requirements at present are difficult to estimate. The current demand apparently exceeds local production by at least 400,000 tons annually. In the year ending June 1946 the total output of steel was 525,000 tons of steel. The total output of rolled and drawn steel products represents about 450,000 tons per year, of which some 392,000 was produced by the **South African Iron and Steel Industrial Corp.** (known as ISCOR).

* * *

APPROXIMATELY 140,000 tons of this went into structural sections, bars and rods, and 16,000 tons found their way to fencing standards and wire.

* * *

THE bulk of **Iscor's** output used to be marketed in the inland areas of the Union, however, the very small tonnage of imports has made necessary the diversion of a portion of the output of the local industry to coastal requirements.

* * *

ISCOR prices now represent an average rise of between 15-16% as compared with prewar prices. These have been due mainly to increased railroad rates and augmented labor costs.

* * *

A new plant is planned with a 320 to 350,000 ton ingot capacity, which will however produce mostly "flat" rolled products. Hot and cold strip mills are included in the plans. This plant to be constructed so as to be readily capable of extension to 1,000,000 tons per year will be located at Vanderbijl Park. The present Iscor's works at Pretoria will see also some expansion.

* * *

WIRE INDUSTRY IN SWEDEN

By Gosta Svensson Sundsvall, Sweden

WIRE has been produced in Sweden for probably more than nine hundred years. This is proven by drawing dies which have been found with other tools and implements amongst ruins from the 11th century.

* * *

IN our time high carbon steel wire as well as low carbon wire, alloyed steel wire and iron wire are produced in Sweden by 33 mills. The raw material, i.e. the wire rods, for the low carbon steel wire is mostly imported whereas the high carbon and alloyed steel wire is produced from Swedish rods. This is a matter of economics, low carbon imported rods being usually cheaper than Swedish low carbon rods and still good enough for the intended purposes.

* * *

OF the Swedish wire mills 25 mills specialize in "Merchant Wire" and "Merchant Wire Products" and 8 mills specialize in "Manufacturers' Wire" of various analyses and for various purposes.

* * *

AS shown by the map, page 801, on which the "Merchant Wire" mills are marked wth a ring and the other mills with a square, most of the mills are located in the southern part of Sweden, as is, by the way, most of the Swedish iron and steel industry.

* * *

FOR many years the wire drawing practice used in Sweden was greatly influenced by Continental wire drawing developments in regard to methods as well as in regard to equipment. During the last several years, however, Swedish wire mills have more and more begun to follow English or American practice and to develop its own methods and equipment.

* * *

WIRE drawing machines as well as furnaces and carbide dies of Swedish origin are now used extensively. This trend is particularly prominent in regard to high carbon steel wire. As a proof of the success of these methods and the high standard of the equipment is taken the steadily increasing export of Swedish high quality wire to United States and many other parts of the world. Amongst the typical Swedish steel wire products manufactured for export may be noted: Valve Spring Wire for automobile motors and other internal combustion engines, Wire for the Watch Industry, Wire for the Textile Industry and Wire for magnetical purposes such as sound recording etc., etc.

* * *

WIRE for the Watch Industry demands homogeneous and carefully controlled grain size in order to obtain suitable machinability and to ensure proper hardening. Furthermore are required perfect roundness and impeccable surface and very narrow tolerances in regard to size as well as in regard to tensile strength. Decarburization may of course not exist.

* * *

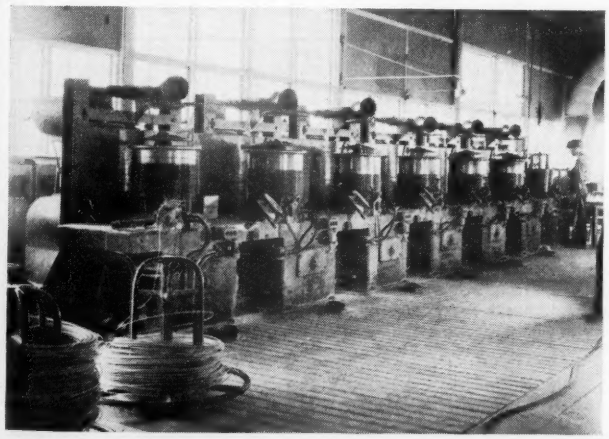
AMONGST the several types of high quality wire used in the Textile Industry may be mentioned Needle Wire and Card Wire. The former demands a very fine surface, very narrow dimensional tolerances, also an analysis and grain structure which renders the proper flexibility needed in making the needles, as well as in the proper hardness of the needles in the finished state. Card Wire must be furnished in such state that it comes out absolutely straight when uncoiled; it must be round and of extremely uniform hardness so as to produce an absolutely uniform product.

* * *

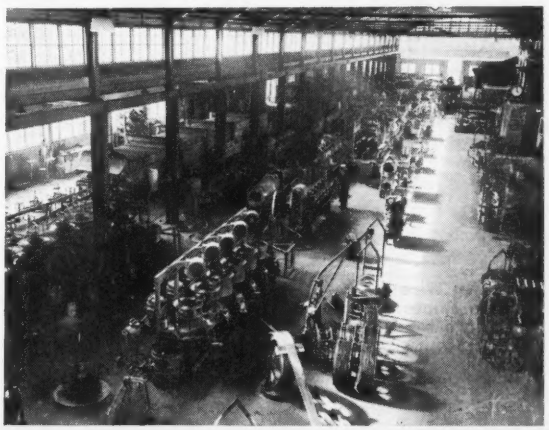
THE requirements in regard to Valve Spring Wire are too well known by the readers of this paper to require special mention but it may be pointed out that research and experiments are carried on continuously with the object of developing Valve Spring Wire of still better fatigue resistance than in the past.

* * *

AMONGST other specialties typical for the Swedish production may be mentioned Wire of the type C about 0.10% and Si about 3.5% for magnetical purposes, Wire



Swedish Continuous Wire Drawing Machine * * * *



Swedish Wire Drawing Mill * * * * *

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4 Abyfors Spikfabriks Aktiebolag, Södra Valbo.
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TABLE I

Years	Drawn Wire			Wire Rod								
	Production			Production			Import			Export		
	1000 tons	Value in mill. of $	$/ton	1000 tons	Value in mill. of $	$/ton	1000. tons	Value in mill.of $	$/ton	1000 tons	Value in mill. of $	$/ton
1936	107	8,9	82,8	110	6,0	54,4	31,5	0,98	30,8	22,4	1,81	80,5
1937	123	12,4	102,5	119	8,2	69,0	61,8	2,90	46,7	26,0	2,50	96,0
1938	104	11,6	111,0	104	6,8	65,3	22,0	0,95	43,0	18,2	1,67	91,7
1939	124	13,8	110,5	127	8,9	70,0	44,6	1,95	42,7	22,4	2,28	101,5
1942	112	19,8	176,5	116	13,3	114,5	14,1	0,95	67,0	11,7	1,87	159,0
1943	115	21,8	190,0	125	15,2	121,5	16,8	1,12	66,0	11,4	2,42	198,0

TABLE II
PRODUCTION OF CERTAIN ARTICLES BY YEARS

Specification of articles	1936			1937			1938		
	1000 tons	Value in 1000 $	$/ton	1000 tons	Value in 1000 $	$/ton	1000 tons	Value in 1000 $	$/ton
Rods	110	5980	54,5	119	8200	68,5	104	6780	65,0
Drawn Wire	107	8850	83,0	123	12600	102	104	11550	111
Wireropes	3,8	825	213	4,5	1100	248	5,6	1360	243
Springs for furniture	1,7	410	241	1,3	300	231	1,8	450	250
Nettings	5,2	690	133	5,5	900	163	5,0	890	178
Chains	6,6	1110	168	8,6	1670	195	7,1	1470	208
Nails, tacks, etc.	35,7	2820	79	36,4	3730	103	29,7	3120	105
Screw-nails	6,2	1220	197	5,6	1410	252	4,4	1170	267

TABLE III

	1939			1942			1943		
	1000 tons	Value in 1000 $	$/ton	1000 tons	Value in 1000 $	$/ton	1000 tons	Value in 1000 $	$/ton
Rods	127	8900	70	116	13350	115	125	15200	121
Drawn Wire	124	13700	110	112	19900	177	115	21800	189
Wire Ropes	5,0	1380	276	9,4	3470	368	8,8	3530	398
Springs for Furniture	2,1	560	267	1,8	620	345	1,9	670	353
Nettings	6,6	1150	174	5,8	1970	340	5,2	1550	298
Chains	7,1	1550	218	6,6	2030	308	7,5	2460	327
Nails, Tacks, etc.	39,7	4100	103	25,7	3910	152	25,2	3950	157
Screw-nails	4,2	1310	313	2,5	1190	477	2,2	1040	472

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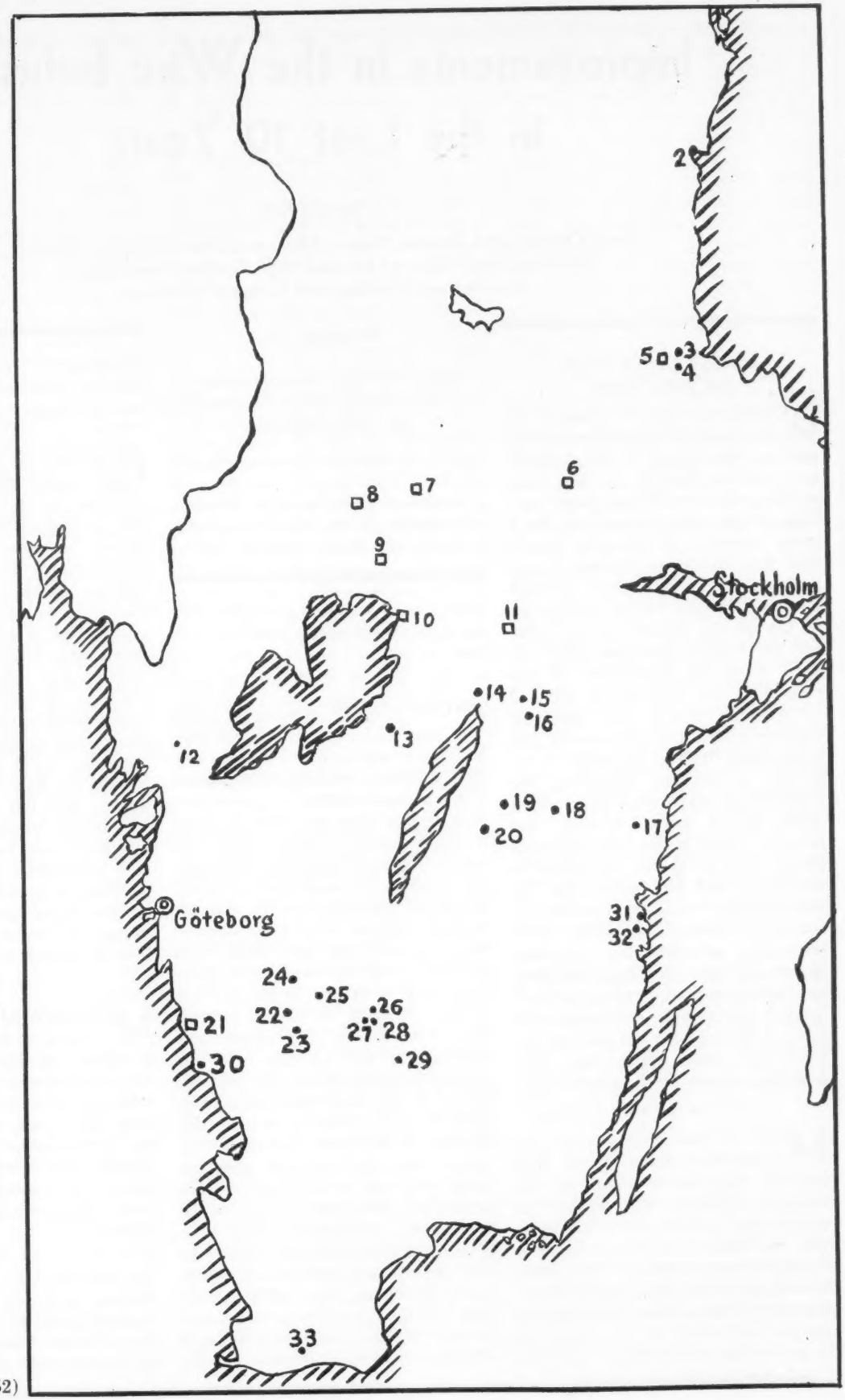

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Improvements in the Wire Industry in the Last 10 Years

A Symposium

Brass-Copper and Bronze Wire — Alloy and Heat Resisting Wires — Stainless Steel Wire — Low and High Carbon Steel Wire — Non-Ferrous Practice and General Summary

Arranged by

Ralph B. Roth, Vice-President
Ludlow-Sayler Wire Company
St. Louis, Missouri.

Symposium presented at the annual convention of the Wire Association in Chicago, Illinois, October, 1947.

BRASS-COPPER AND BRONZE WIRE

DURING the last ten years there has been no outstanding change such as was caused by the development of the Carbide die and flash welding of some fifteen years ago. That change was responsible for a great increase in drawing speeds and the ability to furnish larger packages. Drawing speeds are determined largely by the economics of the set-up. Speeds up to 15,000 feet per minute have been tried out and, while the properties of the copper do not seem to be affected by drawing speeds, the operating conditions are. A much heavier and more rigid drawing machine is required to prevent vibration; the lubricating and cooling medium must be of better quality and handled under better control; much more care must be exercised in die shapes and high polish and the maintenance requires constant attention of trained engineers. Consequently, present day manufacturers of wire drawing machines are recommending speeds of around 3,000 ft. per minute for coarse wire sizes; 4,000 feet per minute for intermediate wire sizes and 5,000 feet per minute for fine wire sizes.

* * *

MOST of the advances of the last ten years have lead towards the improvement of the finished product. The refiner of copper has helped considerably in this direction. The introduction of the spectroscope permits the superintendent of the electrolytic refining tank house to have daily reports on the impurities of the copper he is producing, rather than a monthly report on a composite sample. This leads to much more uniform wire bars.

* * *

CONTINUOUS casting of wire bars and the vertical cast wire bar, have improved the surface and give a more uniform distribution of the oxygen content or an oxygen free copper wire bar. Both of these methods carry a rather high premium. The most generally used wire bar (known as tough pitch copper) is cast in horizontal molds and the surface exposed to the air absorbs some oxygen and also cools with a rather rough or wrinkled appearance. This is known as the set side of the bar, and an expert furnace man can tell by this appearance whether or not he has held the oxygen content within the required limits. It has been European practice for many years to remove this surface mechanically before rolling, where they had to meet specifications requiring a very severe wrap test. This European method of removing the set side was very slow, crude and expensive, but within the last few years mechanical equipment for doing this work rapidly and cheaply has been developed in this country, and this type of wire bar (known as Scalped Copper wire bar or "No-Set" Copper wire bar) is now available at a very low premium.

* * *

IN general, the method of hot rolling copper rods for drawing into wire has not changed in many years. Bar heating furnaces have been improved by being made larger and with several burners installed at different parts of the furnace, so that bars can remain in the furnace longer and at a lower temperature which gives a uniform heat throughout the bar, while with the small old type, end-fired furnace the furnace temperature had to be much above the rolling temperature — with the result of having the outside of the bar, especially the ends, hotter than the center of the bar. In modern furnaces the furnace atmosphere can be better controlled and, by holding the oxygen content as low as possible without going on the reducing side, considerable saving is made by reducing the loss of copper in scale.

* * *

MECHANICAL manipulators or repeaters have been installed to speed up the rolling mill but more important to reduce manual labor on very hot and disagreeable jobs. There is a trend to continuous or semi-continuous rolling mills which will finish rods at double the present speeds and further reduce disagreeable working conditions.

* * *

IN wire drawing, all changes made have been to improve quality especially as to surface condition of the wire. Changes in the types of enamel used and less thickness

in other types of insulation, require a wire freer of surface imperfections that might puncture the insulation, than formerly. Better lubricants and cooling conditions also improvements in die shapes and higher polished die surface, have helped along this line; also the use of minimum slip or non-slip wire drawing machines; but probably the largest step in this direction was the use commercially of the shaved or scalped copper rod. This process takes a rolled rod, gives one draft of approximately 20% reduction of area to round up the rod and harden the surface a little to make better cutting conditions, and it is then drawn thru a die with its face shaped with a sharp cutting edge that shaves off the entire surface of the rod to a depth of 3 to 5 mils. Shaving removes any small slivers and other surface defects, but it is doubtful if it goes deep enough to remove all the effect of the set side of the wire bar. Therefore, to get the best results, the rods used should be rolled from "No-Set" or scalped wire bars. Due to the long life of the carbide dies, the trend is to draw wire that is to be further fabricated in large packages. Wire for further drawing is put on reels of 1,000 lbs. capacity or more, and it is not unusual to have customers ask for #36 wire on 40 to 50-lb. reels.

* * *

CONSIDERABLE advancement has been made in methods of annealing copper wire. For a great many years the Bates Peard type furnace was generally used. This was probably the cheapest method of bright anneal ever used, but it is built with a water seal to keep out the air and this has a tendency to leave water spots or stains on the copper. This is not so noticeable on coils of coarse size wire which will dry off quickly, but with wire on spools or reels it becomes quite serious and if the wire is not respooled and dried promptly — badly discolored wire will be found in the middle of the reel. Most new installations are of the continuous type dry annealing furnace, consisting of a charging compartment where all air is purged with inert gas, a heating chamber, a cooling chamber, and an exit compartment or lock to prevent air from entering at this end. The full length of the furnace is therefore under a controlled inert gas atmosphere.

* * *

STRAND anneal is being used to advantage in a number of cases, especially with fine wire. It consists of a number of small tubes enclosed in a furnace and these tubes filled with inert gas. The tubes are heated hot enough to anneal a strand of wire travelling at several hundred feet a minute during the time it is passing through the length of the tube, which is 20 to 30 feet. This type is valuable where you want to anneal in the higher temperature range, which if used on spool wire would generally result in sticky wire. Strand anneal also produces a much brighter and more uniform color on fine brass wire, than other types of anneal and also gives a cleaner surface on copper wire that is to be used for enameling or tinning. Electrolytically deposited tin is now in the experimental stage and will probably replace hot dip tinning for certain types of work in the wire mills in the not too distant future.

* * *

ALLOY AND HEAT RESISTING WIRES

Improvements in the Alloy Wire Drawing Industry in the Last Ten Years

IMPROVEMENTS in these divisions of the wire industry fall into two general classifications — improvement in quality and improvement in processing. They are interdependent to a certain extent since an improved processing method which reduced costs but also reduced quality would not be acceptable. The aim has been to improve quality and at the same time maintain or reduce costs even in the face of a rising labor market.

* * *

THE sequence of operations in a complete wire mill is melting, hot rolling, annealing, heavy wire drawing, fine wire drawing, with intermediate pickeling and anneals, as required.

* * *

WHEN a customer buys a particular alloy, he has a specific application for that alloy. What he is looking for is wire that will have certain physical, chemical or electrical properties or any combination of these properties. The wide variety of analyses of alloy wires indicates the varied properties that are desired. Since many of these properties are influenced by analysis, improvements must necessarily begin with the control of analysis of the original melt. This, in itself, can be no better than the original raw material which the melter puts in the furnace. Much credit is therefore due to the producers of manganese, chromium, nickel and other major constituents of alloys for their improvements in quality during the past decade. To this must be added the improvement in the deoxidizers and scavanging agents which have so much to do with the quality of the alloy.

* * *

GIVEN access to excellent raw materials, the melter must have the best possible melting equipment to utilize them to best advantage. Since he does not have to refine his raw material by "slagging off" the impurities, he can use melting furnaces, that are primarily melting furnaces and not refining furnaces. Induction furnaces have to a great extent replaced arc furnaces for the production of special alloys of nickel and nickel-chromium. Arc furnaces are still used however, for stainless steels and some nickel alloys for the control of sulphur and other undesirable impurities.

* * *

OTHER aids to the melter are spectroscopic analysis which allows him to get prompt information on how he is controlling analysis and the optical pyrometer for checking pouring temperatures which are important in the control.

* * *

IN the hot rolling operation, the control of atmospheres and temperatures in the ingot heating furnaces have reduced excessive oxidation and rolling "too hot" or "too cold" with disastrous results to quality of the rod. Instruments have replaced the not infallible human eye.

* * *

SINCE the rod cannot be protected from the air during the hot rolling operation, it is bound to oxidize. Scale removal with the minimum metal loss has always been a problem. Annealing and removal of scale or partial reduction of the scale is now done in molten salt baths. The salts used are a combination of sodium, potassium and barium or calcium salts. Ceramic baths heated internally by the passage of current through the salt have come into use in the past few years. Some alloys can be cleaned in a caustic bath with addition of sodium to form sodium hydride. In any case, the metal treated in these baths pickles readily with minimum loss of metal.

* * *

PICKLING baths themselves have been much improved. Internal heating is now being used to some extent with no dilution of the acid and greater economy.

* * *

ADVANCES in wire drawing have centered around better drawing machines, better dies and better lubricants.

* * *

NEW machines in general are heavier and of finer constructions, with consequent reduction of vibration that makes higher drawing speeds possible. Many of them have individually driven blocks. The blocks are directly connected to D. C. motors, giving the opportunity for individual speed control with a minimum of slippage on the block. The smooth pick up in speed of these machines reduces breaks in starting up and results in better all around performance and running speeds much higher than was possible a few years ago. The same general remarks apply to machines for wet drawing.

* * *

THE question of lubricants is an open one and probably still open to improvement. Dry drawing compounds are legion. How much better one is than the other seems to depend on the alloy and machine on which it is used. Much the same is true of lubricants for wet drawing. The function of the lubricant is to keep a film between metal and die to prevent siezure and to reduce die wear. The use of several different types of lubricants in one plant, drawing different alloys on the same type of machine, indicates a probability that no one lubricant will do for all alloys. Considerable improvement in die life and finish has been made possible by the variety of lubricants now available.

* * *

DIE plates and chilled iron dies have rather disappeared from the picture in favor of carbide dies. These are used for fairly heavy shapes as well as for round wire. Plate "setting" is becoming a lost art except among a few old timers. For fine sizes, diamonds still are the best. Skill in drilling and shaping has been acquired in this country due to scarcity of foreign dies during the war. Die life has been greatly increased.

* * *

FOR many users of wire, the finish and physical properties of the alloy are of prime importance. Finish and properties are, to a large extent, influenced by annealing during processing. Some properties required by various users are tensile strength and/or elongation within narrow limits. The lamp and radio industries require tests by sealing into glass, some with and some without the formation of a gaseous envelope around the wire. Control of these and other properties depend to a greater or less extent on the process and finish anneals. These, in turn, require controlled atmospheres in the annealing operations and of course containers for holding the atmospheres. Atmospheres range from dry hydrogen with a very low dew point to complex mixtures of partially combusted gases, all carefully controlled. Containers range from large alloy pots with inlet and outlet for the gas to horizontal tubes, through which the wire is run single strand at constant speed and from which the gas escapes slowly at one end.

* * *

IT is in no one field that advancement has been made, nor is there any sign that the end is in sight. As requirements grow stiffer, more improvements will be made.

* * *

STAINLESS STEEL WIRE

Trend of Improvements During Last Decade in Practice of Drawing Stainless Wire

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THE changes in drawing practices that have been responsible for the present improved quality of stainless steel wire and the more economical operation of wire mills have been gradual. It would be difficult to confine the important changes to any one period of time, yet those that have taken place during the past approximately ten years are notable.

* * *

NEARLY every step in the manufacturing of this kind of wire, such as annealing, cleaning, and cold drawing, has been improved.

* * *

THERE has probably been less change in annealing practices on stainless wire during the past few years than in any of the other basic operations necessary to the making of this wire. For the types of stainless steel that require quick cooling from a high temperature to properly anneal, there are three types of furnaces in use: One is the so called "open fire" in which coils are placed on the floor of the furnace and heated by gas or oil flame burners or electrical resistance heating elements. This type of furnace has been improved by construction changes that have facilitated the handling of the coils, by burner design that prevent direct impingement of flame on the coils and by improved control of the atmosphere in the furnaces. The second type of furnace allowing for quick cooling of the wire is the continuous strand annealing type. There have been little, if any, fundamental changes in these during the past ten years; however, during this time dried disassociated ammonia has completely replaced hydrogen as the atmosphere in the tubes of strand furnaces for bright annealing. The third type of furnace allow-

ing for quick cooling is the salt bath. The electrodes, the furnace lining and the salts have been improved on this type of equipment to give longer life and therefore more economical operation. There are some types of stainless steel wire that require slower cooling after heating in order to properly anneal. During the past, approximately ten years, atmospheres have been used in these furnaces equipped for slow cooling so that there is very little oxidation of the surface of the wire thus making possible better surface after removal of this oxide film.

* * *

THE cleaning houses or pickling rooms have been noticeably renovated during the past decade. Most of them have gone from vapor filled rooms with wooden tanks and overhead cab cranes to rooms with clean air, reasonably dry floors, brick lined tanks, and handling equipment which allows the operator to travel at the side of the tanks rather than above them. The acids used in acid pickling have not changed during the past decade. A new method of descaling bars or wire in coils has been made practical. This is know as the molten caustic method and has two variations, one being known as the sodium hydride type and the other as the virgo salt type. Molten caustic cleaning is accomplished by immersing the coils in the molten caustic for ten to twenty minutes. This reduces the scale. The coils are quenched in water, then immersed in hydrochloric or sulfuric acid pickles for one to twenty minutes to dissolve off the reduced scale. This type of cleaning is economical on the high alloy steels because of its time and metal saving abilities and has also made possible a much smoother surface than was formerly possible when acid pickling only was available.

* * *

THE cold drawing departments have been turning out better wire at higher drawing speeds during the past few years. Contributing factors in this accomplishment are better lubricants, improved tungsten carbide dies, and heavier draw benches or blocks. Each manufacturer of dry drawing compounds, such as soaps or stearates, has been striving continuously to bring out lubricants that would out perform his competitors. There is no question that some have met with fair success during these last few years. The same may be said of the manufacturers of oils for wet drawing. The use of wetting agents in conjunction with lubricants is not new but it has only been during the last few years that they have been used advantageously to speed up wire drawing. The use of grease and paste lubricants without liming for producing a lustrous finish on stainless steel wire has become a more common practice lately. Lubricants are probably the most controversial subject among wire drawers but regardless of their differences of opinions as to makes and mixtures they seem to agree that there has been marked improvement during recent years.

* * *

TUNGSTEN carbide dies were first used for wire drawing more than ten years ago but it is safe to say that the general use of these dies in completely replacing soft or plate dies has taken place during the past decade. During this time the manufacturers of tungsten carbide dies have improved their product greatly as to soundness and toughness of the carbide. It has been recognized that the use of heavier tungsten carbide dies than first used is proving economical. Proper design, that is approach angle, bearing length, etc., as well as better polishing equipment that has made it possible to get a higher surface finish in the hole, have also been a great help in obtaining better life from these tungsten carbide dies. This is also true regarding diamond dies used in wet drawing.

* * *

THE idea of using heavy weight wire drawing machines also goes back more than ten years; however, the general use of these heavily built machines has taken place during the past few years. These machines have certainly been the greatest single factor in getting increased production from the wire drawing department. Their ability to draw wire faster is due to several things. The heavy weight of the machine and precision fit of its parts does away with vibration which greatly effects die life. On the larger or dry drawing machines the blocks are water or air cooled and the die holders are air cooled. This prevents the lubricating coating on the surface of the wire from being overheated and destroyed. The starting equipment is so designed that there is no jerking, thus minimizing the breaking of points and increasing the possible percentage draft per hole. The fine wire drawing machines for wet drawing, as well as being sturdily built which makes them almost vibrationless, use pressure on the lubricating liquid to insure a steady flow of cooled lubricant against each die entrance.

* * *

THE butt welding of coils at the draw benches had become standard practice quite a few years ago; however, modern dies and drawing machines have made this practice all the more valuable in the economy of wire drawing.

* * *

IN addition to the improvements in the various departments mentioned above, there has been a growing tendency to redesign wire mills in order to streamline the flow of materials through the various operations in different departments. Modern lift trucks have been quite a factor in this work.

* * *

THE research and metallurgical control departments have contributed considerable during the past decade to the improvement of stainless steel wire drawing technique. These departments have cooperated in the adjusting of annealing cycles, the establishing of proper percentage drafts during cold drawing, and the proper chemical composition of the wire so that an improved quality of finished wire can be produced in the most economical manner. They have also supervised the use of proper physical testing equipment to assure proper physical control during processing and final inspection before shipment of the wire to customers.

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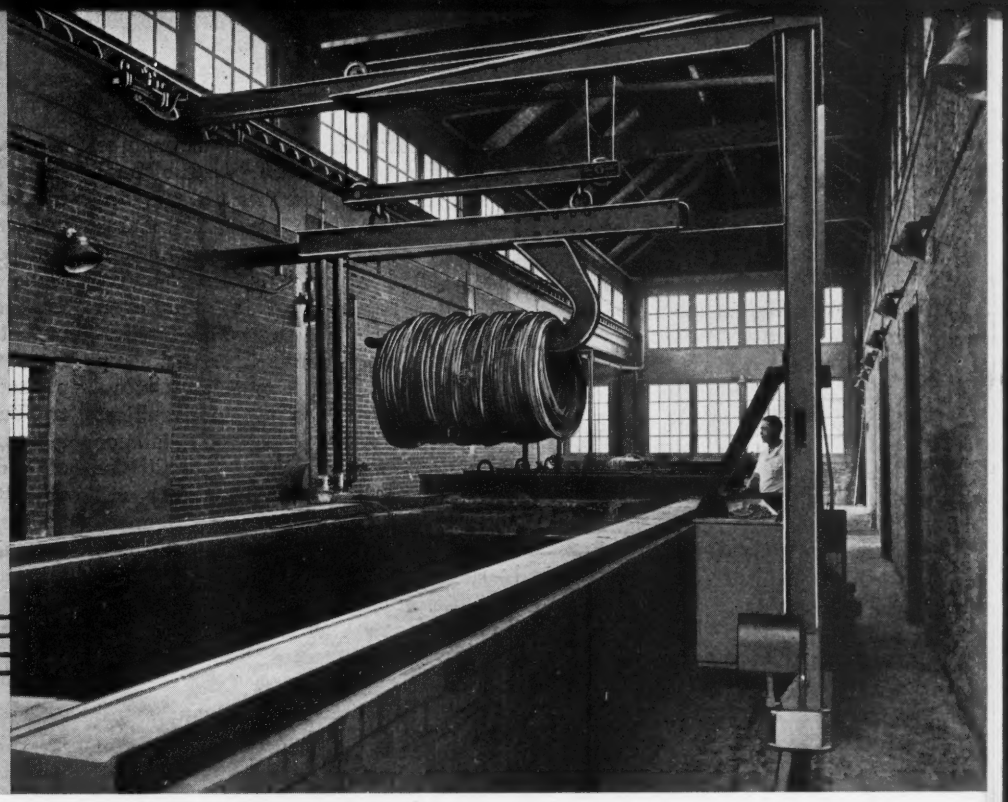

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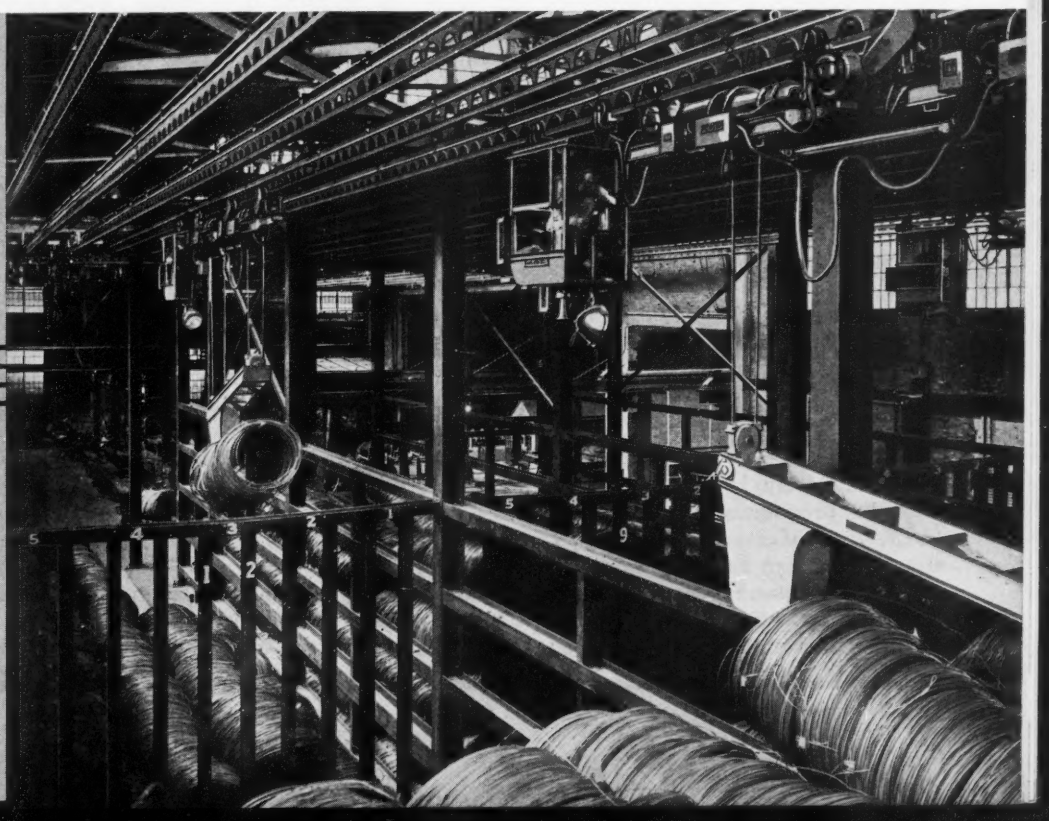

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THE improvements in wire drawing practices used in production of stainless steel wire, which have been so briefly outlined above, show that the latest and most economical methods available are being used to produce stainless steel wire of the highest quality.

* * *

LOW AND HIGH CARBON STEEL WIRE

CHANGE is the natural order of all things, and progress has been the by-word of American industry since its inception. Of all past eras, the most eventful ten year period in our economic and industrial history is that which has just been completed. For, this period embraces not only the greatest world conflict of all times, but also the economic recession period preceding it and the expected—as well as unexpected—readjustment years which follow any war. Industrial progress has been influenced by these historic events, which, in some cases, greatly accelerated the normal rate of progress, and in other instances and endeavors acted to inhibit normal progress. But the gradual, steady force toward improvement and betterment, although modified in rate, has persisted throughout American industry in general, and the steel wire industry in particular.

* * *

IT is true that the influences of war have not produced as spectacular modifications in the wire industry as in some other fields of endeavor; nevertheless, a pause for reflection and analysis of 1947 versus 1937 reveals that the accomplishments made in the last ten years, throughout the steel wire industry are of such magnitude that those of the industry can be justly proud of their achievements.

* * *

Introduction

AN extremely healthy aspect of this progress and development in the wire industry is the fact that the advancement has been so diversified, encompassing the ramified phases of production volume, quality of products, manufacturing methods and operating practices. From the melting of the steel to the final inspection and shipment of the finished wire, all component phases have undergone improvement of varying degrees. It is impossible in a presentation such as this even to touch upon many of the individual advancements that make up the overall evolution of the industry, nor is it possible in a subject of such wide scope to detail or enumerate to any extent all the items of major importance. It will be our endeavor therefore to mention only the predominant high spots of this last decade of progress, quoting in passing a few examples and fine points by way of illustration.

* * *

IN discussing these advances, all credit is not meant to be centered within the wire industry itself, for the efforts of equipment manufacturers and operating supply producers in their cooperative endeavors with the wire industry have aided materially in the results achieved.

* * *

Steel Quality

SINCE the successful production of wire, fine or coarse, begins with the establishment and enforcement of recognized standards of quality at the steel making stage, this phase of manufacture should be the initial subject of our comments on the specific improvements in the wire industry. Wire can be only as sound as the steel from which it is produced. The terrific punishment this steel receives in being reduced through hot and cold working from its initial ingot size to sometimes less than .0001 per cent of this cross sectional area demands inherent quality greater than that required for most steel applications. Uniformity of the raw material, as well as freedom from internal and external defects, is necessary to produce high quality wires suitable to the wire consumers' needs.

* * *

THE general tendency toward larger open-hearth heats has prevailed throughout the period in discussion, with revised furnace designs to provide for enlargement of production facilities, in the older shops. The exceedingly great demands for quality steel during the war necessitated efforts which could not be achieved through enlarged heats alone, but which demanded increased rates of production by reduction of overall furnace time from tap to tap. This was accomplished not only in the wire industry but in all steel melting departments, without sacrifice in quality of product, by the application of new technical knowledge of furnace reactions and slag-metal relationships, as well as by the improvements in automatic furnace controls, regulating and measuring, pressures, temperatures, and other furnace conditions. Also, the expanded use of carbometers and the installation of spectrographs for rapidly checking bath chemical analysis, fostered faster melting rates as well as closer quality control.

* * *

THE chemical uniformity within the heats has materially improved in the past decade through advancements in deoxidation techniques, better mould designs, and greater application of big-end-up ingots. This increased chemical homogeneity throughout the heats means more uniform strength, toughness and other physical properties from bundle to bundle of the wire made from the steel.

* * *

BASIC open-hearth steels have supplanted much of the acid Bessemer tonnage used in the 30's for wire applications. Also, due partially to the war, but principally to advances made in producing extremely high quality domestic steel, the use of Swedish steel in this country for the most critical high carbon wires has greatly diminished with improved performance in the final wire application reported for the American domestic product.

* * *

DURING the war a larger proportion of alloy steel was demanded than ever before, from both open hearth and electric furnace melting shops, and a large share of this comprised special quality items for aircraft or other restrictive requirement applications.

THE war-time NE alloy steels were manufactured in large tonnages as substitutes for the standard pre-war alloy steels which were unobtainable and the success of many of these grades was so great that they have become standard analyses which will continue to be used in wire applications for a long time. Alloy steels today, while only a small percentage of the total wire tonnage, have become a standard commodity, whereas in the middle 30s the alloy grades were still considered as special items and in little demand.

* * *

Hot Processing

THE heating of ingots in the soaking pits has undergone a gradual improvement, due to better design of pits with more uniform and efficient heating and with closer controls through the expanded use of automatic regulating equipment.

* * *

SURFACE conditioning of blooms or billets, where necessary, has changed materially from the slow tedious process of removing imperfections with chipping hammer and chisel. Today, scarfing with a torch is the common practice, and the application of this process to all four sides of a dot bloom at one pass or operation at speeds as high as 200 feet per minute enables some plants continuously to deseam or desurface the steel without high labor costs. On extremely high grade products which demand surfaces far beyond the ordinary, the practice of surface grinding the semi-finished steel has grown in use for applications where the extra labor costs are justified by the final application.

* * *

THE rolling of the rods, which is the final hot processing phase prior to wire drawing, has been affected most noticeably by the installation of new modern mills designed to roll multiple strands of rods in both the fine and coarse gauges, at even greater delivery speeds. Improvements in mill bearings and guides have aided considerably in the attainments of greater production rates on these mills, with higher metal yields, a better shaped product, and a general improvement in surface quality. More compact, neater, and more uniform coils have resulted from improvement in take up reel design; and heavier weight bundles are being produced on the more modern mills, with resultant lower handling and set-up costs in the subsequent wire drawing operations and in the wire fabricator's plant.

* * *

Rod Preparation

HIGH pressure descaling units on the rod mills have permitted closer control of final coiling temperatures and have promoted reduced acid costs in the wire mill pickling department by the reduction in the amount of scale on the surface of the rod. The removal of scale by acid cleaning has not encountered fundamental changes, although the greater use of mechanical agitation, extended automatic pyrometric control, and in some cases the application of submerged combustion heating have promoted more rapid and more effectively controlled cleaning, with lessened tendencies toward overpickling and resultant pitting. Modern installations provide for larger tubs and yokes in direct straight line-cleaning houses as opposed to the circular arrangements of the past. In the field of pickling inhibitors, the trend has been toward the highly concentrated organic varieties, with the virtual elimination of the older foam or blanket type agents—the former having more positive acid saving features without undue retarding of the pickling rates.

* * *

MODERN pickling lines employ a forced water spray box or tank for the final rinse, doing away with the high pressure hand-operated hose formerly in use. Other developments in the cleaning house include advances in the rod and wire coatings applied after the pickling and advances in the subsequent baking procedures.

* * *

ALTHOUGH lime remains the principal coating medium in the industry a number of commercial alkali coatings are being employed by some mills with fair to good success. While some alkali agents are used as a predip in conjunction with lime, most commonly the agents serve as a substitute or replacement for lime. These coatings consist primarily of phosphate or borate compounds, and some reportedly provide improved resistance to rust. With numerous such coatings, drying the rods in circulated or still air, after cooking them in the alkali vat, eliminates any need for the conventional hot baking operation that is essential with lime emulsion coatings.

* * *

VARIOUS wire producers differ as to the overall merits in terms of die life, comparative costs, and resultant finishes produced by these chemical coatings. Some prominent wire men have predicted that lime will slowly be replaced by these new formulas, but present indications do not substantiate such a universal change. There is no denying, however, that the alkali coatings do have favored applications, and they also have a decided cleanliness effect upon the wire drawing department because of their non-dusting nature as opposed to lime.

* * *

THE introduction of the flash baking principal in the industry as a replacement for oven bakers has met with much success. Used primarily for rods and the coarser wire sizes, this method occupies much less space and permits smaller process inventories between the cleaning house and wire drawing departments. This is because the drying and baking cycle, in the rapid circulating hot air current of the flash baker, is completed within a relatively few minutes, as compared to several hours duration required in the old conventional ovens. The advantages in the flash baking of fine wire are not so apparent, because of the difficulty and greater time required to dry the lime solution which is trapped between the adjacent small strands in the bundle, thus either retarding the production rate of the cleaning and coating crane with which

it is synchronized or necessitating numerous flash bakers to maintain production.

* * *

Wire Drawing

THE wire drawing department has undergone major revamping in the last ten years, with new, smooth running, high speed continuous wire drawing machines having replaced, in most mills, the cumbersome slow speed, wire drawing frames. These modern single block and multiblock machines, equipped with all accessories and labor saving devices, including air and water cooled blocks and water cooled die holders, produce larger quantities of better and more uniform quality wire than the frames of yesterday. For a given space up to ten times as much wire can be produced on modern machines as on frames. The smooth starting of the machine drives, compared to the jerky, vibrating initial pull of the frames, combined with the continuous operations on larger rod coils welded together, provide an evenness of operation that bears little resemblance to drawing operations in the early 30's, when each individual coil was separately drawn through every intermediate die.

* * *

THE greatest single factor that has made possible these rapid studies in the modern industry was the development of the tungsten carbide wire drawing die. While this development began over ten years ago, it is during the last decade that this sintered die has definitely proved its value and the full benefits of this development realized by the industry. The alloy steel die, which was supplanted by the tungsten carbide product, is now retained only for special shaped wire purposes.

* * *

THE adaption of the T.C. die as a wire drawing tool set off a chain like reaction in the industry. High speed machines were developed to take advantage of the dies ability to provide large tonnages of close tolerance wire, drawn at speeds which previously were prohibited. Then, in turn, other processing equipment had to be speeded up, and new handling methods installed in order to provide for the traffic of rods and wire to and from the machines. Thus our modern efficient wire mills with high standards of precision and production are possible only because of earlier die research and progress.

* * *

WITH improvements in dies, drawing equipment and rod quality, it has been possible in producing process wire for fine wire drawing to cold work the steel rod far beyond limits thought possible ten years ago. It is now common commercial practice on some grades of product to draft the starting rod as much as 98% reduction in area, using ten or eleven drafts, before resorting to an annealing process to soften the material for further cold reduction.

* * *

THE drawing lubricants have also participated in the forward advances of wire drawing, with a large number of soaps, greases, and special compounds having been developed to serve the particular needs of individual wire drawing applications. Specialized formulas are standardized in the various mills for bright mirror surface wires, for material to be plated, for drawing wires after galvanizing or metallic coating, for securing maximum die life, and for drafting wires with intact lubricated coatings designed to further serve the wire consumer in his fabricating operation.

* * *

IN the field of wet drawn fine wires, similar advances have been made in addition to those already enumerated for the coarse, dry drawn wires. The development of more rigid precision machines, coupled with improved carbide dies, and better controlled diamond dies for sizes under .010", have permitted more drafting, less breakage, and increased finishing speeds up to 2500 or more feet per minute, as compared to the older continuous machines at 800 to 1000 feet per minute. Better cleaning practices on process wire, more uniform annealing, and improved soap and soluble oil lubricants have all contributed to these advances. The replacement of the old liquor solutions with scientifically based lubricating compounds has done much to eliminate the sour odors so prevalent some years ago in the wet drawing departments — thus improving working conditions in addition to the product itself. Likewise, one mechanical change that has made it possible to draft at faster speeds is the replacement of submerged wet payoff reels with stationary dry reels, in some instances, due to improvements in coating and drawing procedures. Also, more effective cooling and lubrication are obtained in the modern cone type machines by causing the solution to be pumped under pressure from a reservoir directly to the dies and capstans.

* * *

Heat Treating Processes

THE heat treating operations applied to rods prior to drawing and the heat treatment of process and finished wires have all been very materially improved during the past decade. Patenting, annealing, normalizing, and oil tempering operations have all undergone changes in the direction of finer equipment, closer control, and better resultant quality.

* * *

IN patenting, the trend has been toward greater production rates by means of wider and longer furnaces, larger take-up frames with more blocks, more accurate temperature controls through automatic regulation and faster block speeds as a result of the longer furnaces and improved heating. In the M.H. and double lead patenting processes improved designs for the heating chambers and lead pans, combined with proper pan cooling facilities have effected the maintenance of more constant and uniform cold lead temperatures.

* * *

ANNEALING processes and furnaces have made their greatest advances in the past ten years. The coal and gas-fired pot annealers are approaching extinction, having been replaced with controlled atmosphere, single, or multiple stemmed, bell or car type furnaces equipped with exceedingly accurate

automatic temperature controls for heating, soaking, and coiling. The installation of circulating fans in the furnace bases has provided additional equalization of temperature from top to bottom of each stem of the charge. The metallurgical advances in heat treating knowledge have led to the development of cyclic annealing and spheroidizing treatments, which produce softer material and more uniform product than was deemed commercially possible ten years ago on many grades of steel, particularly the alloy varieties. Quality demands from the consumer trade have forced improved means for decarburization prevention, embracing new protective atmospheres, more restrictive dewpoint controls, and better base seals.

* * *

THE savings in scale elimination and cleaning costs resulting from bright annealing practices in modern controlled atmosphere furnaces have done much to foster the expanded use of these practices.

* * *

CONTINUOUS normalizing furnaces have come into prominence in some wire mills during the last ten years, primarily on bolt and upsetting steels. In these furnaces the coiled bundles of rods or wire pass on a conveyor through the heating zone, high temperature soaking zone, and cooling zone, in each of which the temperature is separately controlled. These furnaces allow the products of fuel combustion to come in contact with the charge and are therefore scaling in nature.

* * *

MOLTEN salts, while not new, have been endeavoring to secure a stable foothold in the heat treating phases of the wire industry during this past decade. As an annealing medium in salt pot furnaces and as a substitute for lead in patenting, these specially compounded salt mixtures have been striving to compete; but to date the inroads made have not been very great, because of high operating costs in most salt annealing installations, and because as a quenching agent for patenting the salt does not have the heat transfer power of lead.

OIL tempering procedures today are better understood due to modern research on heat treatment fundamentals, and the application of this knowledge to improved unit designs and control of heating, quenching, and tempering time cycles and temperatures has produced tougher and better quality oil tempered wires.

* * *

Precision

IT will be noticed that throughout the foregoing, the principal theme which is repeated over and over is 'greater precision through better control." Mechanized regulators and automatic controls coupled with metallurgical quality checks at various key points of manufacture work to keep the operations and the products constantly "in the grove." Greater mechanical precision and improvement in design have carried forward also into all the auxiliary fields of material storage and in the handling of billets, rods, and wires — with conveyors, lift tractors, and power cranes synchronized to the producing equipment to provide greater efficiency than was possible using the muscle and buggy methods of yester-years.

* * *

THE wire fabricators and consumers have felt this same trend toward greater precision, and increased speed and efficiency, due to advancements in their fields; and the wire users have demanded closer tolerances, more restrictive limitations in chemistry and physical properties, and greater uniformity from bundle to bundle and from shipment to shipment. More elaborate and detailed specifications have been given the wire producer, and the quality of wire has therefore been constantly forced upward to higher levels, by the pressure outside the wire industry as well as by the advancements within.

* * *

Bolt Wires

IN the field of bolt and heading wires, for example, more intricate and complex parts are constantly being transferred from screw machines to cold upsetting machines, and wires are expected to withstand deformations unheard of ten years ago. Extrusion and upsetting can proceed only so far as the quality of the wire will allow, the three most important controlling factors being the softness of the wire, its freedom from surface defects, and the lubricating properties of the coating on the wire. Higher carbon and alloy wires are today expected to meet the severity of upsets previously required of only the more ductile low carbon grades. The wire industry has continued to meet these more exacting applications through improved surface quality, greater ductility or flowability, and lower hardness. Also, the wire industry has recently introduced new heading wire coatings to enable the bolt makers to secure much greater die life than obtained heretofore.

* * *

High Carbon Wires

THE trends in the spring industry during the past ten years have been for the spring maker to use finer gauge wires with slightly higher tensile strength to perform the function where slightly larger wires were used previously. This has forced the wire mills to produce a harder, more resilient wire with the same or greater toughness. In addition, the modern automatic spring coiling machines require a wire of more uniform temper and size, with greater toughness and with closer restrictions on "dead cast" variation than were needed for the older hand knotting machines. Only through the development of better steels selectively applied to each order and by close control throughout the manufacturing process has the wire producer been able to consistently meet these demands.

* * *

THE success of special quality wires, such as piano wire, music wire, valve spring wire, and die spring wire as now made from domestic steels in meeting the requirements of these products previously supplied from Swedish steel is an example of the acomplishments that many skeptics only a few years ago said were impossible.

* * *

Stainless Steel Wire

TEN years ago stainless wire was strictly in its infancy stage, but that industrial child has since come of age. Radical manufacturing advances have been made since 1937 in the rolling of the rods, in drawing practices, in drafting lubricants, and in cleaning procedures for stainless steel. New chemical salt baths and electrolytic means are vying to replace the acid processes for scale removal. The practice of drawing stainless steel with lead as a lubricant is rapidly giving way to cheaper practices as new lubricating means are found. Drafting speeds while considerably slower than for carbon steels, have increased to more efficient magnitudes, primarily because of improved lubrication, new drafting compounds, and improved rod surface quality.

* * *

THIS specialized field is now responsible for practically all types of wire such as spring, rope, heading, wool, welding, and weaving grades. And the increasing demands from the consuming public, because of advantages in appearance, corrosion resistance, and physical properties, are ample evidence of the success of stainless steel wire.

* * *

Forecast

BECAUSE of such typical process and product advancements, the steel wire industry was able to render its great contribution to our nation and its allies during the great war. From coarse wire and bars for shell and fuse parts, for armor piercing bullet cores, and bomb springs, down to fine cable wires for aircraft control systems, for barrage balloon purposes, and for Signal Corps assault usage, the American wire industry developed and supplied huge quantities of specialized products for the armed forces.

* * *

TODAY, this same industry is making every effort to meet the nation's peacetime needs, through utilization of its widened technical knowledge and practical "know how" gained during the war. In addition, the industry is now able to proceed with improvements and its plans for modernization of old equipment which had been held up by the war. This, coupled with the industry's greatest peacetime research and development program indicates only one future for the American wire drawing industry. That future is greater advancement, greater progress and better products more effectively to serve the needs of the American consumer.

* * *

ADVANCES IN THE WIRE DRAWING FIELD DURING THE PAST 10 YEARS

By Earl Glen
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Detroit, Mich.

BY the time any individual change in plant practice has proved its worth — becoming a permanent improvement — it no longer excites comment but is accepted as standard procedure. It is for this reason more than for any other that the last 10 years in the wire drawing industry do not, off hand, seem to have brought about many major new developments. Actually, numerous advances have been made in practically all phases of the wire drawing industry during the past ten years — in cleaning and liming, in baking, drawing, etc. Moreover, many developments — originated more than 10 years ago — did not become general until the last decade. These, too, must be included.

* * *

IN this review, the various improvements will be discussed in the same order as the processes to which they apply take place in the manufacture of wire.

* * *

Cleaning

CLEANING methods have been greatly improved. Modern "straightline cleaning" — that is, with the acid tanks, rinse tanks, lime vats, etc., all in a row in the cleaning house — has obvious advantages over the older method. It permits the easy handling of larger units of wire; reduces labor; economizes in space; etc. The use of molten salt for the cleaning of both stainless steel and alloy steel wire is said to represent an important advance in the manufacture of these types of wire.

* * *

WITH wider appreciation of its importance, the **quality** of cleaning in general has been stepped up and cleaning practice greatly simplified by the use of inhibitors in the pickle tubs. Of course, inhibitors for this purpose were actually introduced more than 10 years ago. However, it has really been only within the past decade that their use has attained widespread proportions.

* * *

Liming

FOR many years, lime has been used to coat wire after cleaning. Today, the majority of wire is still being limed. However, something new in this particular field are such lime substitutes as Magnus, Apex, and Standard compounds. These substitutes are being given a comprehensive trial at present.

* * *

THESE substitutes apparently carry the lubricant as well as lime does. They also help keep the mill cleaner and will not pick up moisture even though exposed to the atmosphere for prolonged periods of time. Although these lime substitutes have not yet stood the test of time, their performance to date seems to promise well for them and may possibly herald another major advance in the art of wire drawing.

* * *

Baking

FOR many years, limed wire was baked in large, long, coal or gas-fired ovens at rather low temperatures. The gas-fired flash baker — a much smaller and more compact unit operating at much higher temperatures and with a forced circulation — was introduced during the past 10 years. It is a distinct improvement over the conventional type bakers for drying lime coatings on all types of wire. Its economic effect can be appreciated

(*Please turn to page* 819)

THE WIRE ASSOCIATION MEDAL AWARDS

For the Most Meritorious Paper on Wire Manufacture or Fabrication During the Year
— BY A MEMBER OF THE WIRE ASSOCIATION —

MEDAL AWARDS

1934 — EDWARD J. P. FISHER
Metallurgist, Keystone Steel & Wire Co., Peoria, Ill.
Title of Paper: "COLD DRAWN STEEL SPRING WIRE"

1935 — BENJAMIN LEWIS McCARTHY
Metallurgist, Wickwire Spencer Steel Co., Buffalo, N. Y.
Title of Paper: "GRAIN SIZE AND ITS INFLUENCE ON THE MANUFACTURE OF STEEL WIRE"

1936 — ROBERT NOTVEST
Chief Engineer, Welding Division, J. D. Adams Mfg. Co., Indianapolis, Indiana
Title of Paper: "STEEL FOR ARC WELDING ELECTRODES"

1937 — BENJAMIN LEWIS McCARTHY
Chief Metallurgist, Wickwire Spencer Steel Co., Buffalo, N. Y.
Title of Paper:
"ABNORMAL GRAIN GROWTH AND THE ANNEALING OF LOW CARBON STEEL WIRE"

1938 — WALTER R. BLOXDORF
Metallurgist, The MacWhyte Co., Kenosha, Wis.
Title of Paper: "WIRE ROPE"

1939 — STANLEY P. WATKINS
Manager, Sales Development, Rustless Iron and Steel Corp. Baltimore, Maryland
Title of Paper:
"THE MANUFACTURE AND USE OF STAINLESS STEEL WIRE"

1940 — ROBERT W. SANDELIN
Metallurgist, Atlantic Steel Company, Atlanta, Georgia
Title of Paper:
"GALVANIZING CHARACTERISTICS OF DIFFERENT TYPES OF STEEL"

1941 — CARLETON W. GARRETT
Wire Mill Metallurgist, Jones & Laughlin Steel Corp. Aliquippa, Pennsylvania
Title of Paper:
"A BRIEF DISCUSSION ON THE MANUFACTURE OF STEEL FOR ARC WELDING ELECTRODES"

1942 — LEROY DEVOE SEYMOUR
Asst. Works Manager, Canada Works, Steel Company of Canada, Ltd., Hamilton, Ontario, Canada
Title of Paper:
"SCHEDULING AND PLANNING THE WIRE MILL FOR WAR PRODUCTION"

1943 — JOHN C. AIKEN
Asst. Supt., Rod and Wire Mills, Jones & Laughlin Steel Corp., Aliquippa, Pa.
Title of Paper: "DRAWING HIGH SPEED ROPE WIRE"

1944 — AUGUST R. ZAPP
Manager, Carbide Division, Firth-Sterling Steel Company, McKeesport, Pa.
Title of Paper:
"HISTORY AND GROWTH OF THE TUNGSTEN CARBIDE DIE"

1945 — MATTHEW J. DONACHIE

Technical Director of Production, Beryllium Corporation, Reading, Pa.

Title of Paper: "SOME TRAITS AND CHARACTERISTICS IN THE WORKING OF BERYLLIUM — COPPER WIRE

HONORABLE MENTIONS

1935 — L. D. SEYMOUR
Metallurgist, Rod and Wire Dept. Youngstown Sheet & Tube Co., Youngstown, Ohio.
Title of Paper: "COLD HEADING WIRE"

1935 — R. A. SCHATZEL
Superintendent, General Research Laboratories, General Cable Corp., Rome, N. Y.
Title of Paper: "HARD AND SOFT COPPER WIRE"

1936 — BENJAMIN LEWIS McCARTHY
Metallurgist, Wickwire Spencer Steel Co., Buffalo, N. Y.
Title of Paper: "PLASTIC DEFORMATION IN WIRE DRAWING"

1937 — ROBERT W. SANDELIN
Metallurgist, Atlantic Steel Co., Atlanta, Ga.
Title of Paper:
"A METALLURGICAL STUDY OF THE FACTORS AFFECTING THE QUALITY OF GALVANIZING"

1937 — ALLAN B. DOVE
Chemical Engineer, Canada Works, The Steel Company of Canada, Ltd., Hamilton, Ont., Canada
Title of Paper:
"A. C. ELECTRO PICKLING—A BETTER METHOD OF PICKLING"

1938 — RODMAN R. TATNALL ,
Metallurgist, Morgan Works, Spencer Steel Co. Worcester, Massachusetts
Title of Paper: "RESILIENCE OF SPRINGS"

1939 — JOSEPH A. DOYLE
Vice President, W. S. Rockwell Co., New York, N. Y.
Title of Paper: "HEATING COPPER WIRE BARS"

1940 — H. BLOUNT and J. D. WILTRAKIS
Mfg. Engineer, Point Breeze Works, Engineer, Kearny Works, Western Electric Company
Title of Paper:
"DESIGN AND OPERATION OF A NEW COPPER WIRE DRAWING PLANT"

1941 — RODMAN R. TATNALL
Metallurgist, Morgan Works, Wickwire Spencer Steel Co., Worcester, Massachusetts
Title of Paper:
"TIME, TEMPERATURE AND SIZE IN THE HEATING OF STEEL WIRE"

1942 — COLONEL FRANK W. BULLOCK
Signal Corps, United States Army
Title of Paper: "THE WIRE INDUSTRY IN WAR"

1943 — E. J. CRUM
General Foreman, Bethanizing and Galvanizing Departments, Bethlehem Steel Company, Sparrows Point, Md.
Title of Paper:
"THE GRAPHICAL SOLUTION OF WIRE MILL MATHEMATICAL PROBLEMS"

1944 — FERNALD S. STICKNEY
Vice President and Chief Engineer, Instrument Specialties Company, Little Falls, N. Y.
Title of Paper: "MAKING 'SPRING-GRADE' BERYLLIUM COPPER WIRE"

1945 — RALPH C. ELLAMS
Supervisor, Electrical Coating Development
Roxalin Flexible Finishes, Inc., Elizabeth, N. J.
Tiale of Paper:
"SUCCESSFUL FINISHING OF ELECTRICALLY INSULATED WIRE AND CABLE"

1945 — D. A. SUTCH, Metallurgist
and B. L. McCARTHY, Chief Metallurgist,
Wickwire Spencer Steel Co., Buffalo, N. Y.
Title of Paper:
"REDUCTION OF AREA VALUES AS A GUIDE TO PATENTING"

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THE Wire Association is a non-profit organization of wire mill executives, superintendents and foremen. It also includes plant engineers, traffic men, and all others engaged in the production of cold drawn bars, rods, wire, strip, insulated wire and cable, and the manufacture and fabrication of finished wire products, including cold headed, extruded and other cold worked metal products.

THERE are separate divisions for all the separate major interests in the wire industry, steel, iron, brass, copper, alloy, and precious metals, together with divisions relating to drawing, cold working, cold heading, extruding, fabricating, forming, spring making, wire cloth, wire rope, bare and covered electric wire and cable and all other forms of wire and wire products.

★ ★ ★

PURPOSES

ITS specific purpose is to improve production methods and afford a clearing house for ideas on management problems, technical problems, and research work in all phases of practical wire drawing and wire working, and to develop and maintain friendly relations among the members.

★ ★ ★

ACTIVITIES:

The Association functions along the following lines:

1. The use of the Association headquarters as a central clearing house for information and data of all kinds which may be of interest to members.
2. The exchange of ideas on processes of production including machinery, technical processes, etc.
3. The establishment and maintenance of friendly relations among the members of the association and the development of sectional and national meetings to discuss matters of mutual interest.
4. Studies of production methods and analysis of production costs.
5. Developments in the use of new materials and new applications of existing materials and by-products.
6. Research and collection of information on personnel management, including such factors as labor turnover, seasonal changes in the demand for employees, wage scales, etc.
7. Standardization and simplification as a means for the effective elimination of waste.
8. Such other subjects as may be determined upon.

PROGRAM

Wire Association Technical Convention

Chicago, Ill., October 20-23, 1947 — Association Headquarters—Hotel La Salle

Wire Association Headquarters at The La Salle Hotel
Will Be Open from Monday, October 20, All Day and Every Evening During the Convention
— Come and Get Acquainted!

THERE WILL BE A REGISTRATION FEE OF $5.00 FOR THOSE ATTENDING THESE TECHNICAL SESSIONS AND INFORMAL MEETINGS

ADMISSION WILL BE BY BADGE ONLY

Open Discussions Will Be Held on the Papers Presented and These Discussions Will Be Published in the January, 1948, Issue of Wire and Wire Products

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St. Louis, Missouri.

Hotel reservations should be made by members of the Wire Association direct to the Secretary.
MAKE YOUR PLANS NOW TO ATTEND AND SEND YOUR RESERVATION PROMPTLY

MONDAY, OCTOBER 20

10:30 A. M. — DIRECTORS' MEETING

12:30 P. M. — PROGRAM COMMITTEE LUNCH

Registration and Information at The Hotel La Salle — October 20-23 — in charge of
Mrs. R. S. Spengel, Secy.-Treas., WIRE & WIRE PRODUCTS

— The Technical Sessions —

RESEARCH PAPERS ARE REPRINTED IN THE OCTOBER ISSUE OF WIRE AND WIRE PRODUCTS

The Discussions and the Mordica Memorial Lecture Will be Printed in the January, 1948 Issue of Wire and Wire Products

MONDAY, OCTOBER 20 Afternoon Session—2:00 P. M.	by Dr. F. R. Morral, Metallurgist Chairman of Meeting	American Cyanamid Company, Stamford, Conn.
OPENING ADDRESS	Rowland M. Hussey	President of the Wire Association
A Symposium	"IMPROVEMENTS IN THE WIRE INDUSTRY IN THE LAST 10 YEARS"	
Arranged by Ralph B. Roth, Vice-President	Ludlow-Saylor Wire Company St. Louis, Missouri	
A Symposium	"OUTLOOK AND PRESENT TREND OF THE WIRE INDUSTRY"	
Presentations by	K. B. Lewis, Cons. Wire Mill Eng. J. L. Schueler, Gen'l. Supt.	Worcester, Mass. Continental Steel Corp. Kokomo, Indiana

TUESDAY, OCTOBER 21 Morning Session—10:00 A. M.	J. R. Thompson Manager Dept. of Metallurgy Chairman of Meeting	American Steel & Wire Company Cleveland, Ohio
PAPER: Electric Salt Baths for Wire Processing	H. J. Babcock, Research Engineer	Ajax Electric Co., Inc. Philadelphia, Pa.
PAPER: Hi-Carbon Wire Drawing	James H. Janssen, PhD. Metallurgist	Wickwire-Spencer Steel Division Colorado Fuel & Iron Corp. Buffalo, N. Y.

TUESDAY, OCTOBER 21 Afternoon Session—1:00 P. M.	PLANT INSPECTION TRIP Wire Mill—Republic Steel Corp., Chicago, Ill. Busses leave Hotel promptly at 1:00 P. M. Please register for trip — Transportation $1.50

WEDNESDAY, OCTOBER 22 Morning Session—10:00 A. M.	Matthew J. Donachie Consulting Engineer Chairman of Meeting	Holyoke, Mass.
PAPER: Wrought Aluminum Alloys, Their Properties, Heat Treatment, and General Characteristics	H. S. Spaulding, Plant Metallurgist	Reynolds Metals Company Louisville, Ky.
PAPER: Cleaning Non-Ferrous Metals with Sodium Hydride	H. L. Alexander, Mgr. Metal Descaling	E. I. DuPont de Nemours & Co., Inc. Electrochemicals Dept. Niagara Falls, N. Y.
PAPER: Measuring Diameter of Fine Wire	Robert W. Carson, President	Carson Micrometer Corp. Little Falls, N. J.

Papers not received in time for preprinting will be published in the November and December issues of Wire and Wire Products.

WEDNESDAY, OCTOBER 22

1:00 P. M.

WIRE ASSOCIATION LUNCHEON — HOTEL LA SALLE

WIRE ASSOCIATION MEDAL AWARD

THE MORDICA MEMORIAL LECTURE

F. TITUS UPDIKE, CHIEF ENGINEER,

Products Engineering Department
Round and Rolled Wire Division
John A. Roebling's Sons Company, Trenton, N. J.

DEMONSTRATION OF THE MAGNETIC WIRE RECORDER
by J. S. Kemp, Engineering Advisor, Armour Research Foundation
Illinois Institute of Technology, Chicago, Ill.

(Members are at liberty to bring guests. Ladies are welcome)

WEDNESDAY, OCTOBER 22

3:30 P. M.

Wire Association Annual Meeting

Rowland M. Hussey,
President, The Wire Association
CHAIRMAN OF MEETING

WEDNESDAY, OCTOBER 22

Evening — 7:00 P. M.

ANNUAL DINNER — STAG SMOKER — HOTEL LA SALLE

THURSDAY, OCTOBER 23

Morning Session — 10:00 A. M.

H. P. EDINGA
Factory Manager
Chairman of Meeting

Elmet Division
North American Philips Co., Inc.
Lewiston, Maine.

PAPER:
The Fabrication of Tungsten Wire

Sidney Schein
and Jack W. Forbes

Cleveland Tungsten, Inc.
Cleveland, Ohio.

A Symposium

"WORLD WIDE WIRE INDUSTRY"

THURSDAY, OCTOBER 23

Afternoon Session — 1:00 P. M.

PLANT INSPECTION TRIP
Hawthorne Works — Western Electric Co.
Busses leave hotel promptly at 1:00 P. M.
Please register for trip — Transportation $1.50

THE WIRE ASSOCIATION MEDAL AWARD

For the Most Meritorious Paper on Wire Manufacture or Fabrication During the Year
— BY A MEMBER OF THE WIRE ASSOCIATION —

ALL members of the Wire Association are cordially invited to submit technical papers either for publication in "WIRE & WIRE PRODUCTS" during the year or for presentation before the Annual Wire Association Convention.

★ ★ ★

AN annual medal will be awarded for the papers coming nearest to the requirement set forth above.

★ ★ ★

CONSIDERATION for the Medal Award is not limited to the papers presented at the Annual Meeting, but is given to all papers submitted by members and published in "WIRE & WIRE PRODUCTS" during the year.

★ ★ ★

ALL papers submitted become the property of the Wire Association and the Board of Directors constitutes the Committee on Awards.

★ ★ ★

SELECTION of papers to be presented at the Annual Convention rests in the hands of the Joint Program Committee and the Board of Directors of the Wire Association.

32 ALUNDUM One Year Old

. . . And Every Bit as Good as Predicted

32 ALUNDUM abrasive has made good on every one of the Hollywood adjectives used to describe it a year ago. In plant after plant 32 ALUNDUM grinding wheels really are proving sensational — really do cut costs by:

grinding faster
grinding cooler
having longer life
requiring fewer dressings

32 ALUNDUM abrasive is entirely new — made differently by a Norton-invented and Norton-patented process.

Each grain is a single, complete crystal — not crushed to size.

Each grain has many sharp points on all sides for faster, cooler cutting.

Each grain is over 99% pure fused alumina for greater resistance to dulling.

32 ALUNDUM wheels are available in *all standard sizes*. They can cut costs for you on cylindrical, centerless, surface, tool and internal grinding.

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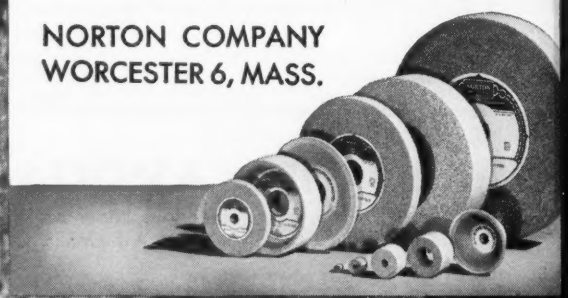


NORTON ABRASIVES

The Greatest Cost-cutting Development in Abrasives in Over Forty Years

*Trade-mark reg. U. S. Pat. Off.

Improvements in the Wire Industry in the last 10 Years

(*Continued from page* 812)

from the fact that it dries lime in from 5 to 15 minutes. In contrast, the older type bakers required anywhere from 6 to 8 hours.

* * *

Annealing

BELL type furnaces with their "controlled atmospheres" now permit the "bright annealing" of wire. The methods of annealing formerly in use — such as annealing in salt baths — left the wire covered with heavy scale. Bright annealing however prevents the formation of heavy scale on the wire, necessitating only a light acid dip for cleaning instead of a thorough soaking in acid.

* * *

Lubricants

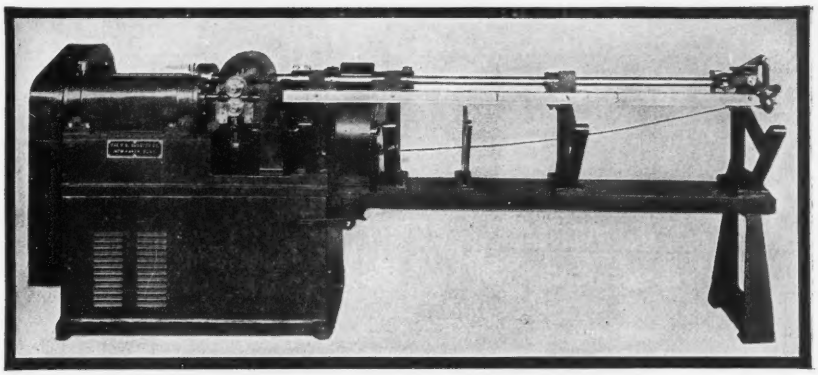
TODAY, lubricants that are specially compounded for use with different grades of wire and for different finishes on wire are available on the open market. Ten or fifteen years ago it was the common custom for each mill to mix its own lubricant according to a formula that had "grown up" in that particular plant. These modern "packaged" lubricants — products of research — give far better die life and are generally more satisfactory than were the "secret" concoctions of the past. They have helped to reduce die lubrication to something approaching a science.

* * *

Drawing Equipment

THE use of continuous machines for drawing wire from rods has increased tremendously during the past 10 or 12 years. Of course, these machines were introduced into the industry more than 10 years ago. However, it has only been within the past decade that the continuous process has become "standard" in practically all wire mills in the country. Two major factors have combined to bring about the success of the continuous wire drawing process.

* * *



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STRAIGHTENER SPECIALISTS FOR OVER 80 YEARS

Some of the refinements developed in that time—

Almost continuos wire travel
Lightening cut-off that assures square ends.
High-speed, direct-driven 5-die straightening flier
Quiet, efficient V-belt drive
Ball & roller bearings thruout
Extreme rigidity
Types for capacities from 1/32" to 11/16" diameter

[DESCRIPTIVE FOLDER SENT ON REQUEST]

THE F. B. SHUSTER MFG. CO., INC.
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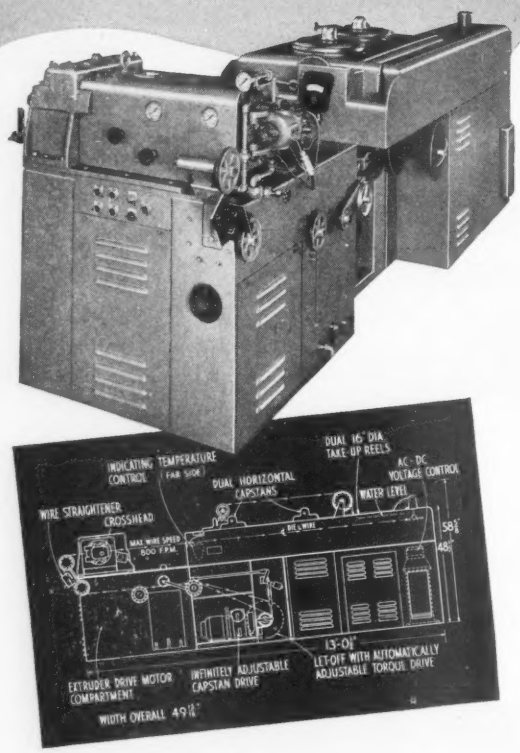
SHUSTER SINCE 1866

Automatic WIRE STRAIGHTENING AND CUTTING MACHINES

COMPLETE PLASTICS

NRM

1½" Wire Covering Unit



CHECK THESE FEATURES

Only 13 feet in over-all length, this compact unit is completely equipped to cover small-gauge wire or cord at high speeds.

EQUIPMENT:

Double 16" take-ups, water cooling unit with dual, horizontal hauloff capstans, AC-DC voltage control, electric die heater, interchangeable cross-head, herringbone drive to extruder screw.

Write for complete descriptive literature on this and other NRM Plastics Extrusion Equipment.

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NATIONAL RUBBER MACHINERY COMPANY

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IN the first place, the wire drawing dies in use prior to the introduction of carbides wore oversize so rapidly that the economies offered by the continuous machine could never have been realized with cast iron and steel dies since they had to be changed with each new bundle of wire started through them. The tungsten carbide die, however, has been able to provide the greatly increased die life necessary for the success of the continuous machine.

* * *

SECONDLY, when steel and cast iron dies were standard, there was never any need to weld the ends of the individual bundles of wire together as there is with the carbide-die-equipped continuous machine. Improved wire-welding equipment — which makes it possible to produce stronger welds between wire ends faster than ever before — together with carbide dies have been the major factors in the success of the continuous wire drawing machines.

* * *

THE great improvements made in the continuous machines themselves since their introduction have also done much to decrease the cost of wire and to greatly step up the overall productivity of wire mills throughout the entire country.

* * *

THERE has also been a tremendous increase in wire drawing speeds. Today, fine steel wire is being drawn at speeds of more than 2,000 feet per minute through Carboloy dies. Not so long ago, top speed was 500 feet per minute. Increase of drawing speed can be attributed to improved continuous machines; better carbide die design and maintenance; and to better all-round mill practice in cleaning, liming, and lubricating.

* * *

Dies

SERVICE life of carbide dies has been increased to a point where their overall mill life must now be measured in **tons** of finished wire. When steel and cast iron dies were used, die life was measured in **pounds** of product. One of the contributing factors to this increased

die life — in addition, of course, to carbide's naturally greater wear resistance — has been the establishing of adequate die service shops in the wire mills, and the instruction of operators in proper carbide die servicing technique. Establishing proper service methods has also eliminated the man-hours and machine-hours lost while waiting for dies to be reconditioned; reduced total number of man-hours needed to service dies; and helped decrease scrap caused by scratched wire.

* * *

MOREOVER, in modern mills, broken carbide dies and dies rejected because of pitting are practically a thing of the past. This is due to a combination of factors, chief of which are improvements in wire drawing equipment; improvements in methods of **encasing** the carbide nib; and the development of tougher and harder grades of carbide than were available 10 years ago for use in the nib. Greater familiarity with these dies of course has resulted in greatly improved die handling methods and care.

* * *

RANGE of wire sizes which are regularly drawn through carbides has been broadened over the past ten year period. Today carbide dies take care of a steel wire size range of from .005″ in diameter to 3″ diameter bar stock. Copper and bronze wire as small as .045″, and pure tungsten wire as fine as .006″ in diameter are all being regularly drawn through carbide dies.

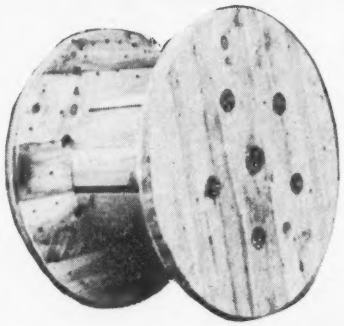
* * *

SCRAP has been decreased enormously during the last 10 years, resulting in larger yield of finished wire (ready to be shipped) from the original rod. Some, if not a great deal, of this is due to the ability of carbide dies to hold size over long runs at high speeds. This gives a better finish on the wire with far fewer rejects because of oversize wire than could possibly be obtained with steel or cast iron dies.

* * *

STAINLESS steel wire is being successfully drawn in quantities today. This was not practicable with cast iron or tool steel dies, due to

REELS



OF

WOOD

RETURNABLE and NON-RETURNABLE

Furnished assembled or knocked down, made to your specifications. Will withstand severest handling. Sturdy, strong, low in cost. Made for

CABLE, ROPE and WIRE

in any size from 12″ to 96″ in diameter.

ALSO, REEL HEADS FOR STEEL DRUMS

Send us your specifications and let us quote on costs.

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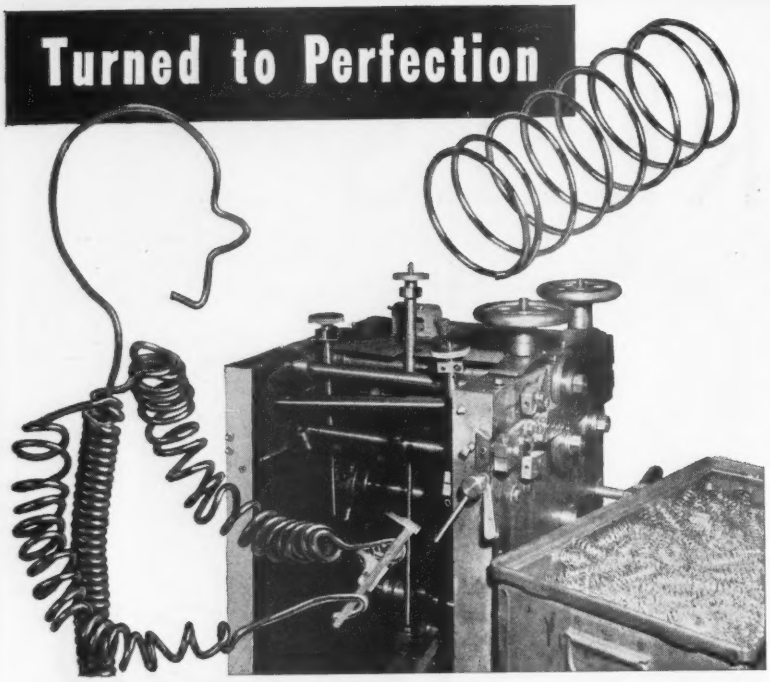


Coil Springs by Illinois Coil Spring Co.*

made of KEYSTONE MUSIC SPRING WIRE

Music Spring Wire is the aristocrat of wire manufacture, requiring care and skill far above ordinary wire.

By its very nature, Music Spring Wire is difficult to draw uniformly—yet uniformity is absolutely necessary for a satisfactory precision spring.

Keystone Music Spring Wire has gained its popularity through the high degree of *uniformity* achieved . . . uniformity that pays off to spring manufacturers by simplifying their production problems and assuring end products of highest quality.

**Illinois Coil Spring Co.,*
Chicago, Ill.

KEYSTONE
MUSIC SPRING WIRE

SPECIAL ANALYSIS WIRE
for all industrial purposes

KEYSTONE STEEL & WIRE COMPANY
PEORIA 7, ILLINOIS

the fast work hardening of stainless steel. Carbide dies, however, do stand up and make the drawing of stainless economically feasible. Thus, carbide dies have actually created a new branch in the wire industry during the past 10 years.

* * *

Mechanical Handling Equipment

IT is especially interesting to note that much of the manual handling of wire throughout the various stages of its manufacture — accepted as a necessity not too long ago — is giving way to mechanical handling devices. At present, small overhead cranes are particularly favored by the industry for this purpose. Fork or ram type trucks run them a close second. Adoption of such mechanical handling methods is increasing production; cutting costs; and reducing operator fatigue.

* * *

Miscellaneous Advances

THERE also have been several advances which, though not directly concerned with the actual **drawing** of the wire, do deserve mention.

* * *

IN the field of galvanizing wire, for instance, great advances over the formerly-used methods of hot galvanizing wire have been made.

* * *

AUTOMATIC machines that coil, crimp, knot, etc., bed springs and cushion springs all in one operation represent an outstanding advance in the field of wire fabricating.

* * *

NAIL machine dies and ha wire guides, and other parts on both wire working and forming machines are now made of solid carbide metal. carbide parts give much service life —resulting in less maintenance and down time of the chines — than did similar parts use 10 years ago.

* * *

IN the foregoing article, an effo has been made to cover the mai advances in the wire drawing in lustry during the past 10 year

as seen by an outsider. There have been innumerable minor advances in every department of the industry, all of which have contributed to the industry's general progress. It has been impossible, however, to include any of these minor advances in this brief review.

* * *

IMPROVEMENTS IN NON-FERROUS PRACTICE

By Matthew J. Donachie
Consulting Engineer
Holyoke, Mass.

IN non-ferrous practice a marked increase in the use of tandem wire rolling equipment for breakdown process eliminates heavy rod benches and bull blocks and heavy dies. The most common size in use is starting with approximately a .420 sq. and cold rolling it to finish at .102 square with rounded edges. In most copper base alloys this product is drawn in one draft to .096" round. The improvements in roll steels with roll design and lubrication has resulted in greatly increased production on these machines in the last few years. The quality of the wire is of excellent standard and the economies to be effected are very substantial.

* * *

DRAWING lubricants of the E.P. oil types in conjunction with carbide dies are starting to encroach upon the field of fine wire which has long been the special province of the soap and diamond. The refractory alloys in particular seem to [illegible]reasing their usage such as nickel high chrome alloys. e copper base alloys with m additions. Some progress to .004" in carbide and oil o been reported in the cop-kel alloys.

* * *

E bright and clean annealing in preferred atmosphere has increased with gradual relegation in many case of the pickle oom to an emergency standby particularly so in the fine wire field.

* * *

NONE of these observations are particularly new but their

MANY SHAPES, MANY FINISHES
... For Thousands of Uses!

Quality control at Seneca allows you to plan production without future worries about material variations. Iron, steel, low carbon, high carbon, tempered or untempered, aluminum and bronze wire are all produced according to the same high standard.

Shapes

Square—Keystone—Flat-Round—Half-Round—Special Shapes—Straightened and cut.

Sizes

Number 40 W & M Gauge (.007) and larger.

Finishes

Liquor Finish—Bright Galvanized—Coppered—Enameled All Colors—Annealed—Tinned—Oil Tempered.

Thousands of Uses

Aircraft	Cable	Hair Pin	Reed
Armor	Car Seal	Hat	Regulator Spring
Armature	Clips	Hat Pin	Ribbon
Bee	Clock Spring	Heddle	Safety Pin
Belt Hooks	Cotter Pins	Hooks and Eyes	Spark Coil Core
Bobby Pins	Curtain Springs	Link Fabrics	Special Springs
Bonnets	Drapery Pin	Lock Springs	Spiral Binding
Bookbinders	Fish Hook	Mattresses	Stapling
Bottlecap	Fish Tape	Needle	Stitching
Box Stitching	Florist	Picture Cord	Umbrella
Brooms	Fuse	Pins-Ropes	Valve Spring
Brushes	Glass Netting	Pin Ticket	Weaving
Button	Grape Tying	Piston Ring	Wire Cloth
	Gutter Broom	Plow Steel	

Save time and money by depending on Seneca Quality Controlled Wire to meet your specifications. Write today for quotation and delivery schedule.

SENECA
WIRE & MANUFACTURING COMPANY
FOSTORIA, OHIO — ESTABLISHED 1905
REPRESENTATIVES AND WAREHOUSES IN ALL PRINCIPAL CITIES

marked increase and their reduction to everyday application seems to have been greatly accelerated in the last five years.

* * *

ADVANCES IN PICKLING

By Walter G. See
Submerged Combustion Corp.
Hammond, Indiana

SUBMERGED combustion has made some strides in applications for the pickling of wire. While the older installations are still in operation, the newer ones are showing low cost and high production figures.

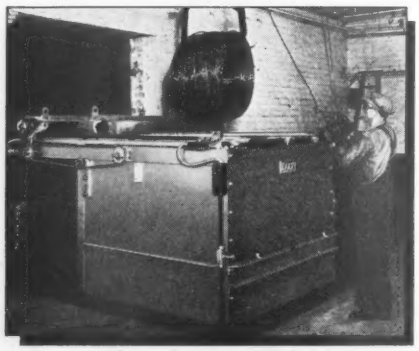
* * *

BECAUSE of the high efficiency of direct fired equipment, it is generally found that gas can be applied to the heating of pickling tanks for a much cheaper operation cost than can steam.

* * *

SPEEDY, SCALE-FREE WIRE ANNEALING

★



Unique Ajax Electric Salt Bath Method provides fast, scale-free production—without decarburization. Cuts operating costs—greatly increases pot-life!

★

Added advantages in this modern, proved annealing method are—less floor space required, less labor, low maintenance cost, shorter time cycles (rarely over 20 minutes), no atmosphere equipment, no scaling, no explosion hazard. This modern electric salt bath annealing by the famous immersed electrode internal heating principle is ideal for annealing low carbon, high carbon and stainless steel wire and rod—in gauges from .020" to .250". Or for annealing aluminum, and copper and silver alloys. Also for descaling stainless and alloy steel wires in molten caustic soda. Recently developed salt mixtures greatly lower the cost of these operations. Interesting case-histories are available. Write for list of users.

AJAX ELECTRIC CO., INC.
FRANKFORD AND DELAWARE AVES., PHILADELPHIA 23, PA.
THE WORLD'S LARGEST MANUFACTURER OF ELECTRIC HEAT TREATING FURNACES EXCLUSIVELY!

THE AJAX HULTGREN ELECTRIC SALT BATH FURNACE

SELF-WELDING • SELF-CIRCULATING

ASSOCIATE COMPANIES:
Ajax Metal Co.—Ajax Electric Furnace Corp.—Ajax Electrothermic Corp.—Ajax Engineering Corp.

IN several plants where submerged combustion equipment was originally installed for the summer months only, so that they would not have to operate their costly steam boilers, they are now using it the year round.

* * *

SUBMERGED combustion is used successfully in tanks containing nitric acid and hydrofluoric acid, or nitric and hydrochloric acids, as well as the more generally accepted sulphuric acid.

* * *

A fume control system has been developed that works 100 per cent on vats up to 16 feet wide. In the past, in these wider tanks, it has been impossible to remove the fumes from the surface of the solution, by any method. At present, it is possible to do this at an extremely low horsepower rate and a very reasonably priced fume control system.

* * *

276 Miles of Wire Thread

A strand of wire reaching from Chicago to Louisville, a distance of 276 miles as the crow flies, can be produced from a chunk of copper no larger than a standard baseball. Such a wire is produced by **North American Philips Company, Inc.**, for manufacturers who build hearing aids and sensitive electrical measuring instruments.

* * *

Steel Mill Rolls

GOLD has been valued as a medium of exchange throughout the ages chiefly because of its scarcity, but iron, because of its abundance and its qualities, has been far more valuable to man.

* * *

NO one metal has contributed as much to man's welfare and comfort. It is the most important metal in an age of metal. Practically everything that surrounds us, whether a necessity or a luxury, has been produced from iron or by means of it.

* * *

SOME articles made from iron are cast, but most are fabricated from sheets, strips, bars, rods or special shapes. These sheets or shapes are made in rolling mills. The red hot metal ingots are passed through one pair of heavy rolls after another, so grooved and spaced that each succeeding pass is smaller and more nearly the desired final shape and size.

* * *

THUS these rolls are one of the chief tools of the metal industry. The making of rolls is a highly developed specialty. It combines science and art, with emphasis on the latter. The science component is metallurgy; the art, practical experience.

* * *

THE surface of a roll cannot have the slightest flaw. It must be perfect in order to impart a perfect finish to the product being rolled. It also must be hard and durable in order to roll hundreds of thousands of tons of steel before it has been worn down to a point where it must be scrapped. Rolls are very expensive, and steel — and therefore automobiles and everything else made from steel—would cost much more today if the roll makers had not improved their product so they not only would last longer but would give a better finish to the metal they roll.

* * *

ROLLS also are used in preparing many other materials besides iron and steel. They are used in all the metal industries—aluminum, magnesium, copper, brass, gold and silver. They are used in making rubber, plastics, paper and glass. They crush rocks, grind flour, and press the oil from cotton seeds. Each industry presents problems of its own for the maker of the rolls.

* * *

THE **Mackintosh-Hemphill Company** of Pittsburgh and Midland, Pennsylvania, one of the world's oldest manufacturers of steel mill rolls, are said to have pioneered important improvements in rolls since the company was established in 1803. The company's list of "Famous Firsts" is long and impressive.

* * *

Produces Miniature Dynamometer

TO measure tension or force in those "tight" spots found in many types of mechanical assemblies, a miniature dynamometer has been developed that is said to be the smallest of its kind. The case measures 3 inches in diameter; the instrument weighs but 1 pound.

* * *

IT is available in 100 lb., 250 lb. and 500 lb. capacities; has an unbreakable lucite crystal and red, maximum hand. The dial is black with etched sliver numerals. Components are die cast of Zamac No. 3 alloy.

* * *

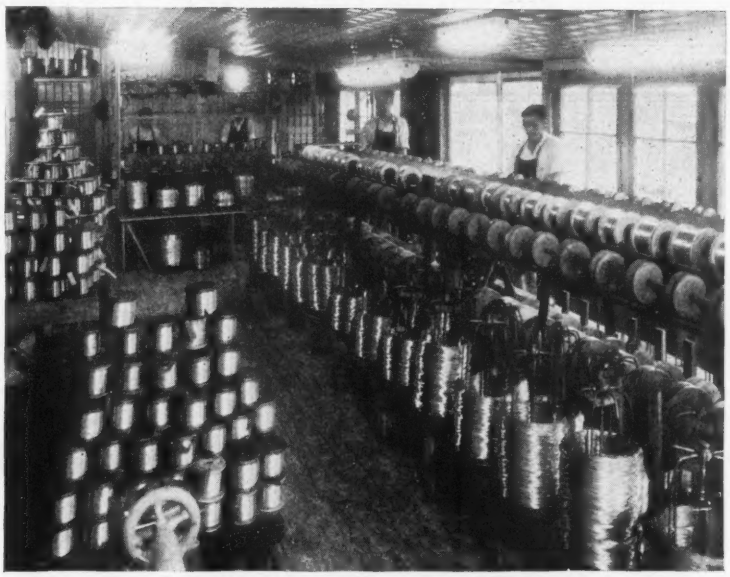
THE company also makes the larger Model AN dynamometer for measuring forces up to 20,000 pounds, identical to the small model in every detail but size. A complete catalog will be sent on request by **W. C. Dillon & Co., Inc.**, 5410 W. Harrison St., Chicago 44, Illinois.

* * *

WIRE SPOOLING
OUR SPECIALTY

BUT WE WILL SPOOL ANYTHING YOU HAVE

— PERMIT THIS MACHINE —
TO DO YOUR EXTRA SPOOLING



90 Head Available — Low Price — Good Spooling
Quick Delivery — Write, Phone or Wire.

* * *

Why Not Allow Us To Quote You

* * *

JERSEY SPECIALTY CO.

LITTLE FALLS 4-0784 **LITTLE FALLS, N. J.**

Outstanding Personalities of the Wire Industry

Roebling Names Hoyt General Manager

TO coordinate the recently-announced program of modernization and expansion of production facilities in the Woven Wire Fabrics Division, **John A. Roebling's Sons** Company, through its president, Charles R. Tyson, announces the appointment of **F. G. Hoyt** as general manager.

* * *

MR. Hoyt, who is widely experienced in the aggregate wire screen and allied fields, will be ably assisted in his new capacity by **J. Fesnell Berger**, assistant manager of sales, and **F. Clifford Peet**, superintendent of production.

* * *

THE Roebling Company recently has installed new looms, crimping machinery and other manufacturing equipment to assure the continued high quality of its present products and to further new developments in rounding out its line of woven wire fabrics.

* * *

Bullard to Manage Metallurgy Division of General Electric

APPOINTMENT of **Robert O. Bullard** as Manager of the **Metallurgy Division of General Electric's Chemical Department** was announced in July by Dr. Zay Jeffries, G-E vice president and general manager of the department.

* * *

MR. Bullard has been engineering and manufacturing manager of the Metallurgy Division since last November, four months after the division was established as the third operating unit of the Chemical Department, with responsibility for the manufacture and sale of permanent magnets and metallurgical products.

* * *

HE joined General Electric as a student engineer in 1930 and served successively in the Generator and Motor Engineering Division and the Generator and Motor Manufacturing Division. In 1939 he was named to the staff of the Schenectady Works Manager as Supervisor of Cost Reduction, and in 1940 became a member of the Defense Coordinating Committee of the Schenectady Works and was made superintendent of the General Electric plant at Fort Edward, N. Y. in 1942. Two years later he assumed additional duties as superintendent of the Carbon Products Manufacturing Divisions.

* * *

Hi-Efficiency

HMT
ESTABLISHED HUGHESVILLE MACHINE & TOOL COMPANY 1846
WIRE & PROCESS MACHINERY

Standard and Special Equipment for the Wire Industry

STRANDERS • SCRAP BALLERS • STRAIGHTENERS
WINDERS • CHEMICAL MIXERS • GRINDERS • COILERS
PROCESSING EQUIPMENT • SPECIAL PURPOSE MACHINERY • PATTERN & TOOL MAKERS

HUGHESVILLE MACHINE & TOOL COMPANY

Hughesville Machine & Tool Co.
54 Academy Street
Hughesville, Pa.
Phone 129A

Thomas S. Hughes
35 Admiral Road
Toronto 5, Ontario, Canada
Phone—Kingsdale 3356

Banks E. Eudy Appointed

BANKS E. Eudy has been appointed director, stainless steel sales, in the manufacturers products sales division of **American Steel & Wire Co.**, subsidiary of U. S. Steel Corp.

* * *

BORN in Eupora, Miss., on February 4, 1893, Mr. Eudy was graduated from McTyeire School at McKenzie, Tenn., before matriculating at Trinity College, now Duke University, Durham, N. C. He travelled through parts of the Mid-West for Simmons Hardware Co., St. Louis, from 1914 to 1917, before being employed by Allegheny Steel Co. at Brackenridge, Pa. He was district sales manager for Allegheny in Cleveland for eight years before becoming associated with Carnegie-Illinois Steel Corp., another U. S. Steel subsidiary, in May, 1936, as district representative of the stainless steel division. He relinquishes that post to assume his new duties with the Wire Company.

Edward L. Stockdale Elected President Universal-Cyclops Co.

EDWARD L. Stockdale has been elected president of **Universal-Cyclops Steel Corp.**, Bridgeville, Pa. He succeeds Walter H. Baker, who founded this firm in 1908 and was its principal executive officer until his sudden death June 26. Mr. Stockdale has held various executive positions with Universal-Cyclops for 33 years, and has been executive vice president for the past 10 years.

* * *

Jessop Steel Co. Appointment

RICHARD M. Paxton Jr. has been elected a vice president of the **Jessop Steel Co.**, Washington, Pa. He joined Jessop in 1924, and has served in various capacities in all of the company's production departments and laboratories. In March of 1927 he was transferred to New York, where for the past 20 years he has been in charge of Jessop's New York branch office.

Percy Jenkins Dies Suddenly

MR. **Percy Jenkins**, Hardware Products Sales Manager, **Wickwire-Spencer Steel Division of The Colorado Fuel and Iron Corporation** died suddenly at the age of 47.

* * *

BORN in Quincy, Massachusetts, he attended Mercersburg Academy in Pensylvania and Staunton Military Academy in Virginia. At Harvard University he was a three-letter man, football, baseball and track. He was active in the University being a member of the Class Committee, the Athletic Committee, Student Council, Varsity Club, Institute of 1770, the SK Club, Phoenix Club, Hasty Pudding Club and Owl Club. He was graduated with the degree of Bachelor of Arts. He joined the Wickwire-Spencer Steel Company in 1925 and rose to be Sales Manager of Hardware Products of The Colorado Fuel and Iron Corporation, the successor Company. In September 1946 he was elected President of the Insect Wire Screening Bureau.

Phone 2-3043

HOWSAM SPOOL COMPANY

500 RATHBONE AVE AURORA ILLINOIS

E. B. Cleborne Appointed

E. B. Cleborne, vice president and director of **Allegheny Ludlum Steel Corp.,** Pittsburgh, has been elected executive vice president of the corporation, assuming his new duties September 1. Prior to the merging of Allegheny Steel and Ludlum Steel in 1938, Mr. Cleborne had been a vice president and director of Ludlum Steel Co. He is also president of Wallingford Steel Co., Wallingford, Conn., a subsidiary company of Allegheny Ludlum, and will continue in that position.

* * *

Trownsell Appointed Chief Metallurgist Wire Division of Continental Steel Corporation

W. O. Trownsell, 37 years old, Chief Metallurgist of the Wire Division **Continental Steel Corporation,** Kokomo, Ind., since 1936, has been appointed Chief of Metallurgy and Inspection for the company.

* * *

TROWNSELL, who graduated from Purdue University in 1931 with a Bachelor of Science degree in chemical engineering, became associated with Continental that same year as a chemist. Until 1936, he also was engaged in experimental and research work for the company.

* * *

Colorado Fuel & Iron Appointments

THE following appointments have been announced by the **Colorado Fuel & Iron Corp.,** Denver: **Howard J. Davis,** formerly assistant manager of wire product sales, has been appointed manager of product research and development for the Colorado Division. **Floyd E. Watson** has been promoted from district sales manager of the Salt Lake City office to manager of sales, wire products, for the Colorado Division. **James N. Counter,** district manager of the Phoenix teritory, has been transferred to the Salt Lake City territory in the same capacity. **Cliff Martin** has been appointed district sales representative in the Phoenix territory. In Texas, **Lou J. Renner** has been appointed manager of wire rope sales, and **Luke Helms** appointed assistant manager of wire rope sales, but will have his headquarters office in Denver.

* * *

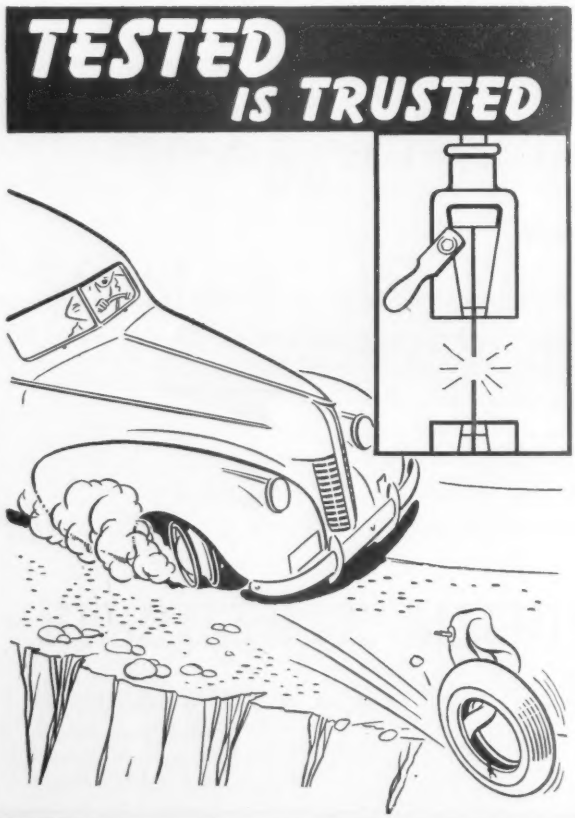
Stickley to Handle Distributor Promotion for Carboloy

APPOINTMENT of **Robert L. Stickley** as Distributor Promotion Specialist has been announced by E. C. Howell, Advertising Manager, **Carboloy Company, Inc.**

* * *

MR. Stickley, who succeeds T. D. Emerson, recently resigned, was formerly Advertising and Sales Promotion Manager at Progressive Welder Company and prior to his service in the armed forces, was connected with two Detroit advertising agencies — Brooke, Smith, French and Dorrance and Ross Roy, Inc. He was also with the General Motors Customer Research Staff for two years.

* * *



HOW GOOD was the BEAD?

*Scott Tester Model J-5 is universally used for testing tire wires for elongation and tensile strength. Capacities up to 1,000 lbs. World-standard tests; "picturized" graph results.

"Adequate Testing Always Pays"

SCOTT TESTERS

*Registered Trade Mark

SCOTT TESTERS, INC.

55 Blackstone Street • Providence, R. I.

SPECIALISTS

IN PROCESSING MACHINERY FOR THE

WELDING ROD MANUFACTURING INDUSTRY

WELDING ROD FEEDING MACHINES
EXTRUSION DIE HEADS
END BRUSHING MACHINES
MIXERS
FLUX COATING CENTER GUAGE

WELDING ROD EXTRUDING PRESSES
TAKE-AWAY CONVEYORS
CONVEYOR TYPE ELECTRODE OVENS
SLUG PRESSES
SCALES

WIRE STRAIGHTENING AND CUTTING MACHINES

We maintain a complete Engineering Department and are in a position to design and build any auxiliary equipment which you may need.

MOSLO MACHINERY COMPANY

2443 Prospect Ave. Cleveland 15, Ohio

INTRODUCING –

UNION DIAMOND LAPPING COMPOUND

UNWIDIE

Now you can have standard UNION grades of diamond powder, known as "tops" in die rooms throughout the country, in a new easy-to-handle form: DIAMOND PASTES, pre-mixed with easy-flowing lubricant, supplied in handy EYE-TIP TUBES. All UNION grades, from 6FF through 4C, are available in the new tubes. WRITE FOR FOLDER DP-7.

Of course regular UNION diamond powder, unexcelled in quality for die room use, is available as always.

DIAMOND DIES **DIAMOND POWDER** **RECUTTING MACHINERY**

THE UNION WIRE DIE CORP.

24 Gore Street
Hamilton, Ontario

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375 Fairfield Ave.
Stamford, Conn.

AUTOMATIC
STRAIGHTENING AND CUTTING
MACHINERY
equipped with
FLYING SHEAR
for
ALL KINDS OF MATERIAL

THE HALLDEN MACHINE CO.
THOMASTON, CONNECTICUT

QUALITY WIRE
FOR YOUR PRODUCT

The appearance, production and cost of your product is greatly influenced by the quality of wire used. Let Laclede engineers and metallurgists aid you in developing wire specifications to fit your exact need.

Wire for All Needs
All Grades and Finishes
Bright or Black Annealed
High Carbon Spring
Low Carbon Bright Basic
Tinned, Galvanized
Copper Coated — Liquor Finishes
Sizes: .007 –.50 Dia.
Coils, Spools, or Cut Lengths

LACLEDE STEEL COMPANY
SAINT LOUIS, MISSOURI

A Review of Recent Wire Patents

No. 2,424,974, METHOD OF AND MEANS FOR FORMING COILS, patented August 5, 1947, by George H. Erb, South Orange, N. J., assignor to Federal Telephone and Radio Corporation, Newark, N. J., a corporation of Delaware.

For forming an internally-wound coil, the inventor proceeds to wind on the apices of the threads of a threaded collapsible mandrel, then screws the mandrel with the coil thereon into an internally threaded coil support, and then collapses and withdraws the mandrel, leaving the coil in the internally formed threads of the coil support.

* * *

No. 2,425,049, COMBINATION PLANT STAKE AND LOCK, patented August 5, 1947, by Terrence Sheridan, Hamiota, Mantioba, Canada.

The device is constructed wholly of wire including a stake of wire with an eye loop at its upper end and a short wire locking-bar associated therewith.

* * *

No. 2,425,235, FILTER, patented August 5, 1947, by John Ferrante, Johnstown, N. Y., a corporation of New York.

This filter comprises a wire mesh entirely coated with a pile of flocking material.

* * *

No. 2,425,266, MACHINE FORMARKING WIRE, patented August 5, 1947, by Charles R. Robbins, Keens, N. H., assignor to Markem Machine Company, Keene, N. H., a corporation of New Hampshire.

The machine includes a pair of type wheels between which the wire is fed, a type element mounted on the periphery of each type wheel, these type elements being so disposed on the two type wheels that they act on the wire alternately as it is fed forward, each type wheel having a wire-guiding and supporting portion disposed to provide the entire guiding and supporting means for the wire while the type element of the other type wheel is making its printed impression on the wire.

* * *

No. 2,425,294, METHOD OF MAKING INSULATED MULTICONDUCTOR STRUCTURES, patented August 12, 1947, by John T. Morgan, Charleston, W. Va.

After shaping a bundle of conductor wires, each provided with a coating of thermoplastic insulating material to the approximate contour of an armature coil, the inventor attaches thermoplastic insulating material to selected portions of the coil, then subjects the selected portions of the coil and the associated insulating material to heat and pressure to first soften the thermoplastic material and the coatings then to press the same into a solid homogeneous mass, and then shapes the coil under heat and pressure to accurately fit an armature slot.

* * *

No. 2,425,511. TOROIDAL COIL WINDING MACHINE, patented August 12, 1947, by Robert M. Conklin, West Newbury, Mass., assignor to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York.

Pressure pads function to hold a loop of wire until it is reduced to the size of the turn it will form on the coil.

No. 2,426,090, COIL WINDING METHOD, patented August 19, 1947, by John Gartner, Hasbrouck Heights, N. J., assignor to Bendix Aviation Corporation, Teterboro, N. J., a corporation of Delaware.

This method comprises placing an insulating strip of adhesive material about a number of spaced coil winding supporting members so as to assume a channel formation, positioning a wire in this channel, winding the wire in the channel about the insulating strip so that the completed coil and insulating strip assume a loop shape defined by the spaced supporting members, taking wire leads from the coil at different points, and turning the free edges of the insulating strip over so as to encase the completed coil in the adhesive insulating strip with the wire leads projecting therefrom.

* * *

No. 2,426,413, MANUFACTURE OF INSULATED ELECTRIC CONDUCTORS, patented August 26, 1947, by William

Complete Description and Drawings of Patents May Be Had for 50 cents, outside the United States and Canada $1.00. Address, Wire & Wire Products, 300 Main St., Stamford, Conn.

All-Metal WIRE SPOOLS

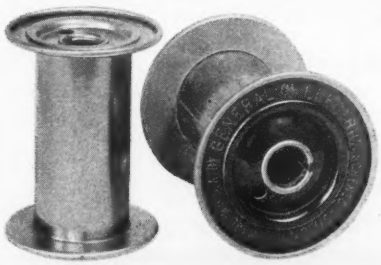
CABLE SPOOLS ... for Insulated and Rubber Covered Wire, Solder, and similar products.

Lightweight, all-steel, non-returnable Spools. Ends lithographed in your established color scheme and design.

Available in end diameters of 5", 6-1/2", and 10-1/2".

Ends and traverses may be shipped unassembled. A simple operation on a hand, foot, or power press makes a rigid assembly.

FINE WIRE SPOOLS ... for Winding and Shipping Fine, Steel, Copper, and Enameled Wires.



Spools are formed from steel with one-piece ends. Full curl on edge assures smooth winding. Entire spool finished in special lacquer, with ends embossed for identification.

Made in 2-7/16" and 3" diameter Ends.

We will send samples at your request.

J. L. CLARK MANUFACTURING CO.
600 23rd AVENUE • ROCKFORD, ILLINOIS

Francis Ogilvie Pollett, Gravesend, England, assignor to W. T. Henley's Telegraph Works Company, Limited, Dorking, England, a British Company.

The inventor proceeds to apply to a conductor a covering of polyvinyl compound as polyvinyl chloride and the copolymers of vinyl chloride and vinyl acetate containing up to 15% of the acetate, together with a plasticizer, then wets the surface of this covering with a paste consisting of an ungelled dispersion of powdered polyvinyl chloride in a non-volatile plasticising liquid, applies a textile covering to the wetted surface and then heats the covered conductor to a temperature above the gelling point of the paste, thereby bonding the textile material to the polyvinyl compound.

* * *

No. 2,426,522, APPARATUS FOR WINDING HELIXES patented August 26, 1947, by Charles Benjamin Albert Porter, Hillingdon, England, assignor to Heathway Engineering Company Limited, Hillingdon Heath, England, a company of Great Britain.

Helixes of wire are wound on a longitudinal support to form a series of electrode structures for electron discharge tubes by the use of this machine.

* * *

New Service Report Describes Improved Pickling and Neutralizing Procedure

HOW certain specialized acid inhibitors and neutralizing materials promote cost-savings and improved-quality production in the pickling of iron and steel, is the subject of a special, illustrated Service Report recently published by Oakite Products, Inc., New York.

* * *

THIS Service Report provides valuable data on this manufacturer's Pickle Control materials used in the pickling of high and low carbon and alloy steel bar, round, sheet, tube and wire stock. Among the important advantages claimed for these specialized Pickle Controls by the manufacturer are: (1) they save metal; (2) save acid; (3) lower production costs; (4) reduce obnoxious fumes; (5) eliminate overpickling; (6) reduce hydrogen embrittlement; and (7) provide cleaner work.

* * *

A feature of this Report is a special section containing graphs showing the action of these Oakite acid pickling inhibitors in reducing metal loss. A comparison chart and table show how these materials reduce acid consumption and extend life of pickling solutions by lowering iron sulphate build-up. Supplementary data includes instructions for making up, controlling and maintaining sulphuric acid and hydrochloric acid pickling solutions. Report also stresses the importance of neutralizing materials in protecting pickled surface against rust, and in removing smut, streaks and stains so as to improve surface appearance and facilitate subsequent fabricating operations.

* * *

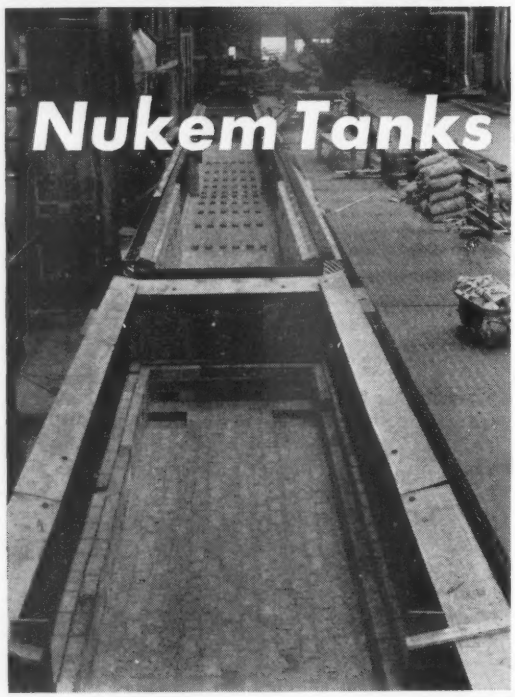
THOSE desiring free copies of this Service Report should address their requests to Oakite Products, Inc., 152A Thames Street, New York 6, N. Y.

* * *

An ADVERTISER likes to know his ads have been read so please mention WIRE & WIRE PRODUCTS when writing him.

Men Who KNOW

insist on Nukem Tanks



■ Because NUKEM Pickling Tanks have established a reputation over the years for dependable, trouble-free operation, they are preferred by operating men everywhere.

NUKEM Tanks are acid, wear and leak proof even under the most severe conditions. Many NUKEM Pickling Tanks have been in service for 10 to 15 years with no time down for repairs.

Among the various NUKEM acid-proof materials is one which meets practically any acid-proof construction problem. You will find our experience in acid proof construction extremely valuable. Let us submit recommendations on your problems.

NUKEM Products CORPORATION

117 COLGATE AVENUE, BUFFALO 20, N. Y.

Nail Production—A Complicated Business

THOSE nails being used to construct the new houses in your neighborhood are members of just one group of a large family, which includes a multitude of sizes, types, and finishes.

* * *

NAILS by the billion are pouring from the busy machines in the mills of the **American Steel & Wire Co.**, the world's largest nail manufacturer.

* * *

"NAIL production is being maintained at an exceptionally high rate", says C. F. Hood, president of American Steel & Wire. "Currently, approximately 150 carloads—or over a billion—nails are leaving our mills every week."

* * *

THE Company produces nails ranging in size from the giant 15-inch boat spikes used for the construction of wooden barges, wharves, and other heavy timbered installations, to the barely visible escutcheon pins, only 3/16 inches long and as fine as a needle, used for attaching name plates and trademark insignia to a multitude of items.

* * *

THE largest nail is 5/8 inches square and weighs 1 lb. 10 oz., while the smallest weighs so little that it takes 95,000 of them to weigh one pound.

* * *

IN between these two extremes are over 1100 different types and sizes of nails, each with its specific use. The entire nail industry shipped 662,500 tons of nails last year, but even though it is estimated that 70% of that tonnage was in housing sizes, demand still exceeds supply, particularly for home building.

* * *

BY far the largest portion of nails manufactured in the United States are made of plain carbon steel. However, they also are formed from copper, bronze, stainless steel and aluminum.

* * *

COMMON steel nails are furnished with almost any type of finish the user desires. They can be bright, galvanized, coppered, brass plated, cement coated, cadmium plated, tinned and painted. Some nails are even blued, resulting from a sterilization process for those nails which the users hold in their mouths.

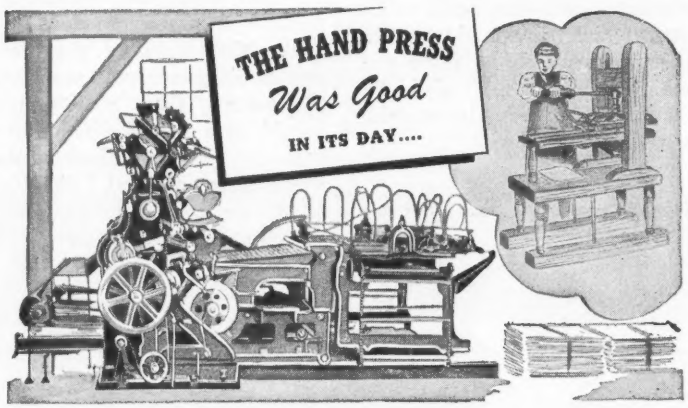
* * *

PACKAGED in 100-lb., 125-lb., and 200-lb. kegs and in wood, fibre, or paper boxes containing from 2 oz. to 50 lbs., nails find their way into a large number of products, each calling for certain specifications as to size, the type of head, type of point, and finish.

* * *

THEY are furnished with common flat heads, in addition to oval, checkered, flat countersunk, oval countersunk, cone, and brad heads. There are even headless nails, to say nothing of those with two heads which, unlike the sideshow freak whose heads are side by side, are formed one below the other.

* * *



BUT...

It would be of little value in turning out the volume of high quality work scheduled and delivered by today's printing plants. In the field of pickling

CHEMICALS ACP PROCESSES

RUST PROOFING AND PAINT BONDING
Granodine *
Duridine *
Alodine *
Lithoform *
Thermoil-Granodine *

RUST REMOVING AND PREVENTING
Deoxidine *
Peroline *

PICKLING ACID INHIBITORS
Rodine * ®

Rodine

has made comparable results possible. A small amount of RODINE, added to either sulfuric or muriatic pickling baths, assures precision control and at the same time saves good metal from attack, prolongs the effective life of the bath and reduces acid wastage. Over-pickling and hydrogen embrittlement are held to a minimum. Scale-removal is greatly facilitated.

For better pickling and more pleasant working conditions—use RODINE.

AMERICAN CHEMICAL PAINT CO.
AMBLER ACP PENNA.

NAILS can be furnished which have been softened by heat treatment, or they can be given a different treatment which hardens them.

* * *

FREQUENTLY a nail with extra holding power to resist extraction is desired. One method of giving this added resistance is to make a larger shanked nail, thus providing more holding surface. In addition however, a cement coating will increase friction, as will acid etching —which pits the surface—and "fetter rings", which are impressed around the circumference of the shank. The grip marks which are visible immediately below the head of the nail and which are made by the metal grippers which hold the nail and which hold the nail while the head is being formed, also provide additional holding power.

* * *

THE grip marks in many cases provide the clue by which experienced nail men can tell not only what company manufactured the nail, but from what plant it came. The elimination of one or more grip marks on either or both sides of the nail often is the method of identification. American Steel & Wire has been called upon by police officials to help identify nails which were a clue in a criminal case.

* * *

THE most popular nails for housing construction comprise 11 sizes in the 3-penny to 20-penny groups. 3-penny nails are 1-1/4 inches in length, while the 20-penny size is 4 inches long.

* * *

THE origin of the system by which nail sizes are associated with pennies is open to debate. Some authorities maintain that centuries ago in England nails were sold by the penny. Thus, a 10-penny nail would be a size of which 100 would cost 10 pence. Other authorities insist, however, that 1,000 10-penny nails weighed 10 pounds, while 1,000 16-penny nails weighed 16 pounds, etc. Whatever the origin, the "penny" system of size identification has become traditional and does not seem destined to be replaced in the near future.

* * *

Folder on Industrial Marking and Coding

A new brochure describing twenty-two different industrial marking and coding machines has been issued by **Adolph Gottscho, Inc.**, 1 Hudson St., New York 13, N. Y. Illustrations of each machine in operation are accompanied by explanatory information about their applications and uses, while a handy tipped-in index identifies the machines according to the articles they are designed to mark or imprint.

* * *

CLASSIFIED generally under headings of "Automatic", "Semi-Automatic" and "Manual Marking Machines", the products illustrated are designed for imprinting, indenting, semi-perforating and etching almost anything from paper bags to cylindrical metal parts. Copies are available on request from the Gottscho Company. Request brochure 2G.

SUMFOAM PICKLING COMPOUND

PRODUCES A THICK BLANKET OF FOAM ON THE SURFACE OF A PICKLING SOLUTION TO HOLD DOWN FUMES AND ACID SPRAY FORMED IN PICKLING. KEEPS DOWN THE OBJECTIONABLE "BITE" IN A CLEANING HOUSE, ESPECIALLY IN COLD WEATHER PICKLING OF ROD AND WIRE.

NEPTUNE ACID ADDITION AGENT

A PICKLING AID FOR CLEANING HARDWARE CLOTH IN MURIATIC ACID CONTINUOUSLY OR IN COILS. IMPROVES ZINC COATING, REDUCES PICKLE FUMES, PREVENTS "DRAG-OUT" OF MURIATIC ACID.

Free samples and complete information on request.

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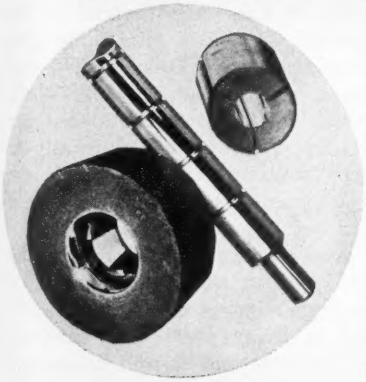
HIGHLAND BUILDING, PITTSBURGH 6, PA.

Producers of "NEP" Acid Inhibitor

HYPREZ DIAMOND COMPOUNDS

Finish Your Wire Drawing Dies from Rough-Cored to Mirror Polish

Faster ... AT LOWER COST WITH SUPERIOR RESULTS!



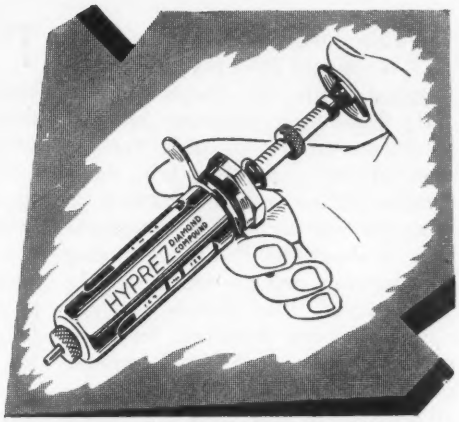
Hyprez Diamond Compounds will completely finish your steel and Tungsten-Carbide dies, from rough to lasting mirror polish, free from marks and scratches.

Clean, virgin, accurately-graded, diamond powders are permanently suspended in the patented compound. There is no mixing or stirring, no waste or loss of time.

Performance is uniform; better results are certain; hours of skilled labor are saved.

The unretouched photos at left show Hyprez finished dies and mandrel. Customers' names will be furnished on request.

Ask For Free Demonstration.



Safe Substantial Applicator for Complete Job Control

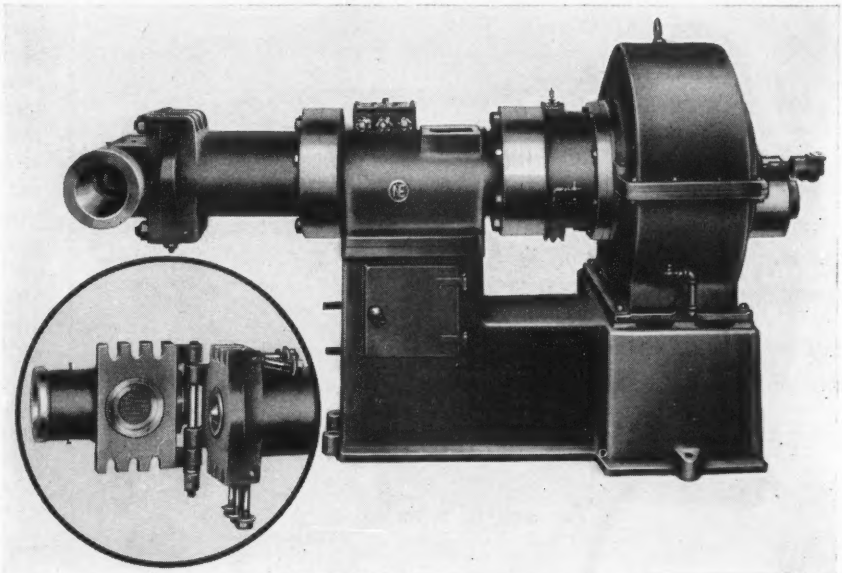
Hyprez is available in a full range of color-identified compounds in sealed glass cartridges. Applied in exactly metered amounts with the Hyprez Applicator Gun, especially designed for economy and ease of operation. The Hyprez Reduction Needle, for fine work, dispenses the compound in pinpoint quantities.

Representatives in All Principal Manufacturing Areas

HYPREZ DIVISION
ENGIS EQUIPMENT COMPANY
431 SOUTH DEARBORN STREET • CHICAGO 5, ILLINOIS, U. S. A.

PLASTICS INSULATION EXTRUDER

This sturdy 4-1/2" steam heated plastic insulation wire covering machine has large capacity to permit faster operation on a wide range of wire diameters. This same machine with minor changes can be converted for rubber insulation. These machines may also be arranged for either electric contact or oil heating of the cylinder. Consult with National Erie engineers for recommendations.



National-Erie 4-1/2" Wire Extruder designed to handle "Geon" plastic insulation.

NATIONAL-ERIE CORPORATION
ERIE, PA. U. S. A.

The Fabrication of Tungsten Wire

(*Continued from page* 771)

snapped with the fingers. From sixty thousandths diameter, the rod is drawn into wire using carbide dies to approximately ten thousandths diameter. The drawing is done hot at an average temperature of about 1800°F. Speeds during the drawing process are relatively slow, varying from twenty feet per minute to one hundred feet per minute. The speed is dependent primarily upon the size and type of heating furnace used, the speed being controlled to obtain the desired temperature through the die.

THE drawing at these temperatures demand a rather special lubricant that will stand up under such conditions. The usual oil types or greases could not be used; and eventually graphite was discovered to have the peculiar properties needed. As a result, graphite suspensions in either oil or water are common to the tungsten drawing process and serve not only as a lubricant, but as a protection to the tungsten surface from oxidation. For this reason, the ordinary forms of uncleaned tungsten are always black.

* * *

BELOW ten mils down to the smallest possible size, approximately three ten thousandths of an inch, tungsten is drawn hot using graphite lubricant through diamond dies. It is usual to anneal the tungsten wire designed for the smallest sizes at some intermediate step in the process. These sizes may be 14 mils, 10 mils, 5 mils, or 3 mils, depending on the physical characteristics of the wire desired at the finished size. Such annealing is accomplished by means of single stranding through water cooled boxes. The wire passes between mercury contacts spaced usually 15" apart in an atmosphere of hydrogen. By passing a sufficient current through the wire, it is heated to the point necessary to remove the cold working characteristics only. If the annealing is carried out at too high a temperature, the wire will recrystalize; and it will be so brittle that it will be practically impossible to continue further drawing.

* * *

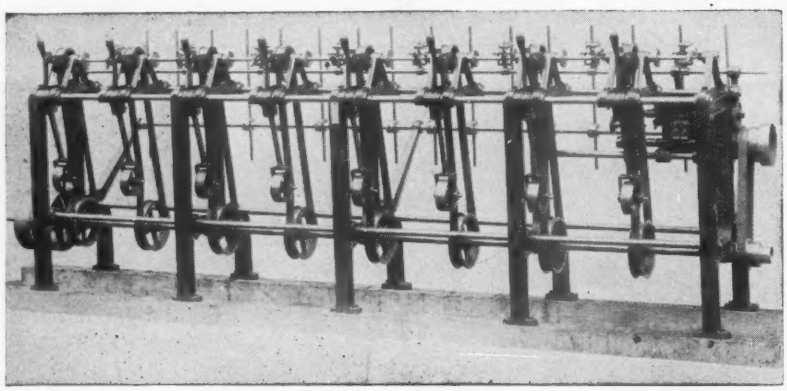
HOT drawing as practiced in the tungsten industry is novel to the extent that it has not been used to any degree in drawing any of the other wire materials. By hot drawing is meant drawing at a temperature higher than room temperature but lower than recrystallization temperature of the material. A rather broad generalization of the temperature used is that equivalent to one quarter of the melting temperature. Under such conditions many materials can be drawn to considerable reductions of area, providing they do not air harden, without intermediate annealings. It is quite possible that many alloys which today give considerable difficulty in drawing could be hot drawn with little trouble. We suggest this drawing method as worthy of investigation.

* * *

TUNGSTEN wire and filament below 20 mil in diameter is very ductile. By this we mean the wire can be coiled on a mandrel as small as 100 percent of the wire diameter. It can be formed into intricate shapes, and is exceptionally strong.

* * *

WIRE SPOOLING MACHINES



No. 1900E SPOOLER

Model illustrated takes spools up to 12" diameter. Floor space required: 19" x 10'; length can be varied to suit largest spool specified. Handles wire up to .050" diameter. Other models made to suit specific requirements.

EMORY SPOOLERS are built for years of continuous service. Precision made, durable, rugged, dependable.

BUILDERS OF WIRE SPOOLING MACHINERY for A HALF CENTURY

For details, write to

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NEWARK 5, N. J.

Telephone: Bigelow 3-4415

IN Table A is shown the average tensile strengths of various size tungsten wires.

* * *

IN the as-worked condition, tungsten wire and filament has very little stretch. Under the usual tensile method of testing, such wire will stretch not more than two percent in a ten inch length; and the yield point is practically at the breaking point. Youngs modulus is approximately sixty million pounds per square inch.

* * *

TUNGSTEN wire, in the annealed condition, has considerably more stretch than the cold worked wire. Elongation up to as high as ten percent in a 10″ length has been obtained in the smaller sizes. At the same time the tensile strength is reduced as much as fifty percent depending on the amount of anneal.

* * *

THE method of working tungsten wire has a very definite influence on the physical properties, particularly that of tensile strength. The original size of the ingot started with, the percentage reduction per pass, the temperature variation in drawing, all very greatly influence the resulting wire. These variations are not completely eliminated by process annealing. Since, as has been previously explained, the wires are not recrystallized in the annealing process, the variations, therefore, persist through the finished product. For this reason, tungsten wires produced by various manufacturers vary quite widely in their physical properties.

* * *

MOST of the tungsten wire and filament is used under conditions of severe temperature and, therefore, become crystallized in position. The type of crystallization has a very profound influence upon the performance of the tungsten filament. For example, normal tungsten filament recrystallizes in a relatively fine grain, and under these conditions cannot be successfully used as coiled filaments in the modern incandescent lamp. Filaments which contain an extremely small percentage of modifiers, crystallize so that the crystal practically fills the diameter of the filament and may be several centimeters long in the axis of the filament. This type of wire in coiled form is extremely rigid at high temperature and does not sag, as does the finer grain filament. Incidentally, a coil made from long grain crystal is much less susceptible to shock breakage.

TABLE A

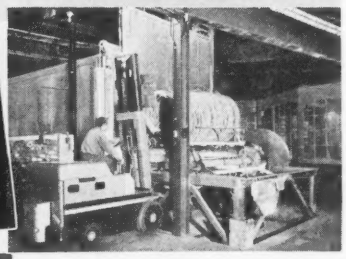
.100 dia	160,000 lbs/sq. inch	.010 dia	380,000 lbs/sq. inch
.080 dia	195,000 lbs/sq. inch	.005 dia	420,000 lbs/sq. inch
.060 dia	245,000 lbs/sq. inch	.003 dia	480,000 lbs/sq. inch
.040 dia	285,000 lbs/sq. inch	.002 dia	530,000 lbs/sq. inch
.020 dia	320,000 lbs/sq. inch	.001 dia	545,000 lbs/sq. inch

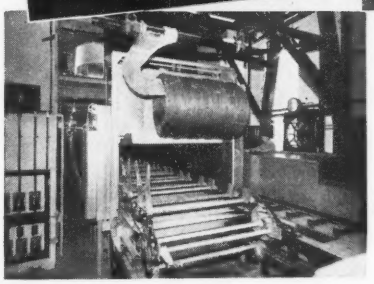
* * *

TUNGSTEN wire in the as-worked condition, if protected from oxidation, has considerable strength at relatively high temperatures. The following are data on the relationship of tensile strength of a small tungsten wire with temperature:

how GILBERT & BENNETT Saved 60% TIME — 80% LABOR

with their ROSS STRAIGHT-LINE WIRE and ROD BAKER





Completely Automatic Operation

(PUSH BUTTON CONTROL)

This remarkable new ROSS Wire and Rod Baker at Gilbert & Bennett Mfg. Co's Georgetown, Conn. plant marks a new high point in wire making efficiency and production. Replacing older type equipment that required considerable labor and time to operate, this new straight line ROSS BAKER has raised plant capacity two and one-half times, increased cleaning house efficiency at least 20% and reduced labor cost by 80%.

This completely automatic ROSS BAKER is 100′ long and is in straight line with the cleaning apparatus. Its ingenious intermittent conveyor system makes it possible for one man to take care of more than 200′ of equipment.

In its design, construction and operating advantages, this ROSS Wire and Rod Baker is an example of results attainable with ROSS engineering.

ROSS SYSTEMS — J.O.ROSS ENGINEERING CORP. — DESIGNERS AND BUILDERS OF AIR PROCESSING SYSTEMS — ROSS CONTROL OF AIR FOR MODERN INDUSTRY SYSTEMS

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ROSS ENGINEERING OF CANADA, LIMITED — MONTREAL 19, P. Q.

CARRIER-ROSS ENGINEERING COMPANY, LIMITED, LONDON, ENGLAND

Temperature °F	Tensile Strength–lbs/sq. inch
Room Temperature	430,000
100° F	420,000
200° F	395,000
300° F	375,000
400° F	350,000
500° F	335,000
600° F	315,000
800° F	280,000
1000° F	245,000
1200° F	220,000
1400° F	195,000

* * *

THE electrical resistance of fabricated tungsten is approximately three times that of copper, but it also has a high coefficient of resistance. An average resistance for pure well-annealed tungsten at room temperature is approximately 33 Ohms per circular mil foot. A commonly accepted coefficient of resistance up to a thousand degrees centigrade is .0045.

* * *

GENERALLY speaking, fabricated tungsten has many unique properties not possessed by any other metals. Its extreme ductility, its ability to withstand extremely high temperatures under certain conditions, its extremely high tensile strength at both the usual and high temperatures, and its relatively low electrical resistance have made a definite place for its widespread use in modern industry.

* * *

AS mentioned before, in comparison with most of our other popular metals, the amount of tungsten fabricated annually is quite small. It must be remembered, however, that with the gradual transformation of our methods of living, and with our greater dependance upon electrical equipment, and control devices, radio, and Radar and its many ramifications, tungsten, in all forms, is one of the critical metals which we cannot do without.

* * *

Du Pont Describes Method For Polishing Stainless Steel

THE **Du Pont Company** describes a new method for polishing stainless steel in an operating manual, "Du Pont Electropolishing Solution," just published. The technique, which makes use of a solution of glycolic acid, sulfuric acid, and water provides the metal finisher with a new, economical method. It is not expected to entirely displace mechanical finishing.

* * *

THE electropolishing solution, according to the manual, remains liquid at room temperature. It operates over a wide range of current densities. Non-technical operators easily control and maintain the method at peak effiicency. Non-freezing characteristics of the solution eliminate temperature maintenance during periodic or week-end shut downs. Equipment used in electropolishing is substantially the same as for electroplating.

* * *

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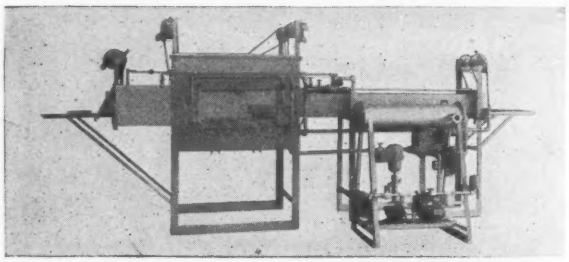

TYPE LA

For CLEAN annealing, copper brazing, silver soldering in Controlled Atmosphere

The famed "Certain Curtain" control conquered the most difficult atmospheric problems in high speed steel treating. These same patented methods are available in equipment expressly designed for clean annealing, copper brazing and silver soldering at temperatures up to 2000°F. Conveyor and batch types. Additional external atmosphere generator available. "Certain Curtain" equipment dissociated ammonia or hydrogen assuring the utmost in economical protection for every operation.

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for the

1947 WIRE BUYERS GUIDE

LABOR RELATIONS

by John B. Stone,
Washington, D. C.

The sixth of a series of articles on the subject, with particular reference to problems of the wire and wire products industry. The author is a noted authority on the subject.

LABOR relations at the plant level are still much too confused to justify any conclusion regarding the effect of the Taft-Hartley Act upon the long range dealings between plant managers and the men who work on the production lines.

* * *

BOTH major labor federations, the American Federation of Labor and the Congress of Industrial Organizations, have failed so far to develop a broad policy governing the reaction of their member unions to the new law. Leaders of some of the most powerful unions within both general groupings have declared flatly that they will have nothing to do with the new setup and will conduct their negotiations as if there were no Taft-Hartley law and in some cases as if there were no National Labor Relations Act. An extreme example of this fiction is the International Typographical Union, conservative and powerful member of the AFL.

* * *

ON the other hand, some of the biggest unions in each federation have made it plain that though they will work for repeal of the Taft-Hartley Act, they will comply with its provisions in full while it is on the statute books in order to benefit as much as possible from the advantages of the National Labor Board procedures. Among these is the huge International Ladies Garment Workers of the AFL headed by David Dubinsky.

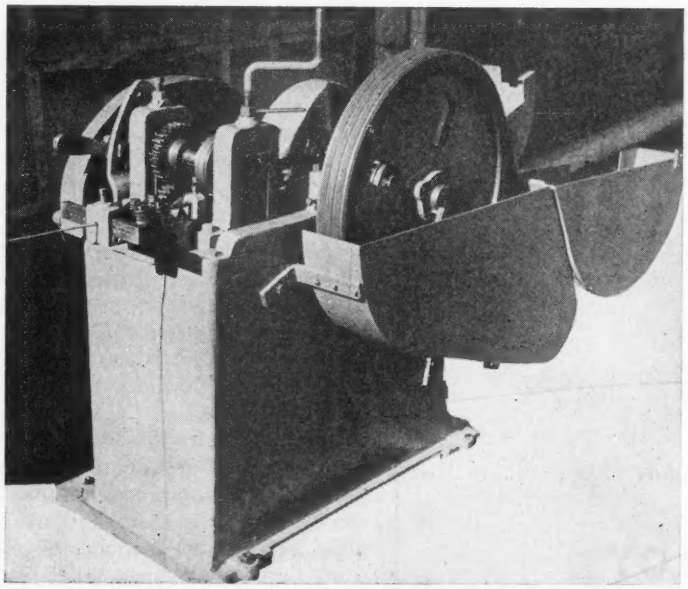
BETWEEN these two extremes can be found labor leaders who represent a dozen different gradations of opinion as to how labor unions should react to the new law.

* * *

FROM the point of view of a plant manager in the Wire and Wire Products industry, it is clear that any effort to employ the harsher terms of the Taft-Hartley law at present may lead to extended trouble with labor which may in turn cause an extended stoppage of production. Such efforts, from a standpoint of continued high production and profits can be justified only on the grounds that the benefits to be gained in the long run may be greater than the losses incurred at the moment.

* * *

THERE are dozens of cases in almost every industrial area



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Manufactured Exclusively for:

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Also Wire Bale Tie Machines, producing single loop, round or oval ties, 2000 per hour; 3 to 16 ft.

which might serve as examples for small and medium sized manufacturers, of how efforts to use the new law may cause trouble. In Bridgeport, Conn., for instance, where Bridgeport Brass has filed suit against present and past leaders of a local of the Mine Mill and Smelter Workers (CIO) the feeling of labor unrest has become general and predictions of strife in the near future are being made generally.

* * *

PERHAPS the simplest "guinea pig" case for purposes of illustration is the trouble that developed between the Globe Steel Company and a local of the United Steel Workers of America, (CIO).

* * *

THERE was a contract in the plant which provided for reopening on the wage issue. The union called for such a reopening. Labor and management failed to agree on a wage increase under the clause and the union called a strike.

* * *

THE company went into the State courts to seek an injunction, claiming that the reopening clause did not provide for the men going on strike and charging that the union had violated the contract by walking off the job.

* * *

THE union contended that it was within its rights under the contract and cited a similar situation during the war under which the National War Labor Board ruled that strikes were legal under the wage reopening clause. The injunction was refused and the case dismissed.

* * *

THE company, however, immediately filed suit for damages of $75,000 plus $30,000 for each week the strike continued. This suit was filed under provisions of the Taft-Hartley Act.

* * *

THE Union, instead of retreating, continued the strike for another week. Finally it was settled and one provision of the settlement was that the company withdrew its damage suit and released union members from all liability for having gone on strike. Net result of the strife was the loss of production for a full month and an increase of ill feelings on the part of both management and labor. No conclusion about the Taft-Hartley Act's legality was reached though the union had challanged its constitutionality in replying to the damage suit.

* * *

MANAGEMENT representatives here are not inclined to jump to the conclusion that they will not make any use of the Taft-Hartley Act, but on the other hand they are reluctant to jump into a row with labor unless there is some prospect of gain involved. So far, most of them appear to feel that the risks of losing production during the current sellers' market are too great. They are inclined to wait until the situation has jelled more firmly.

* * *

AT present it appears that some more definite conclusions will be made within the next sixty days concerning what the official reaction of most labor unions will be.

* * *

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During recent months die manufacturers in increasing numbers have been taking advantage of our prompt deliveries of tungsten carbide die nibs for wire, rod and tube drawing dies.

Our 9 and 9A grades of tungsten carbide have been compounded especially for these purposes, and have given uniform satisfaction in long life and dependability. All standard sizes. Special sizes and shapes made to blueprints.

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65 COLDEN STREET, NEWARK 4, N. J.

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NATIONAL conventions of both the AFL and the CIO will be held this fall and it is likely that action will be taken during these sessions.

* * *

IN addition, many strategy meetings are being held monthly by attorneys for the larger unions. Out of these meetings may come a general pattern of action.

* * *

PENDING such a development, most management representatives are inclined to continue their labor relations on a day to day basis, as best they can. They feel that it is most important to keep their plants in production without the interruptions of strikes, at the present time.

* * *

Plastic Injection Molding Machine For Sheet Run Productions

SEVERAL interesting features are incorporated in a newly designed 3/4 ounce capacity molding machine recently introduced by **The Moslo Machinery Company** of Cleveland, Ohio. The unit was developed for fast production of color chips and samples, tensile and compression bars, small custom moldings and mold test runs.

* * *

THE MINIJECTOR features a complete interchangeable cylinder and heating unit that can be switched in less than three minutes from the molding of one material or color to another, without costly halts for flushing or cleaning. The low cost of the complete heating unit permits keeping several on hand to accommodate quick changes in materials and color testing operations. Changing the units requires only a few minutes.

* * *

THE hopper is mounted directly above the heating chamber. The cylinder is heated by a thermostatically controlled 450 watt, 110 volt, AC or DC unit. A dial indicator type thermometer provides an accurate check on temperatures which may be varied up to 650°F.

* * *

THE unit is designed to use a tapered, self-locking die of an

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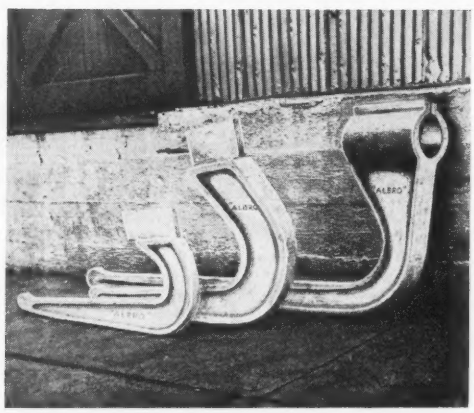

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CANADIAN GENERAL ELECTRIC COMPANY LIMITED
Toronto, Canada

IF IT'S MACHINERY WRITE WILLIAMS — CANADA'S LEADING MACHINERY HOUSE

THE **A.R.WILLIAMS MACHINERY** COMPANY LIMITED

HALIFAX MONTREAL OTTAWA TORONTO WINNIPEG CALGARY VANCOUVER VICTORIA

inexpensive type. The standard die size is 4½" x 2" x 2⅝", although the length can be varied to accommodate odd long shaped pieces. A built-in hand or foot operated knock-out mechanism removes the die from the die holder easily and quickly.

* * *

THE hard chrome plated piston is ¾" in diameter. The heating cylinder is kept filled with molding compound by simply twisting the knob attached to the hopper after each injection. A 50 lb. force on the 22" hand wheel provides a nozzle pressure of 12,000 P.S.I.

* * *

THE low initial cost of this machine places it within the range of schools, development engineers, testing laboratories and small manufacturers.

* * *

The New Moslo Electronic Eccentricity Gauge

THE Moslo Machinery Company, Cleveland, Ohio, announces the completion of an Electronic Eccentricity Gauge for testing welding rods during the extruding process before or after baking. This gauge can be used by the large manufacturer. Development of this gauge is the direct result of intensive experimental and research work in the application of electronics to the concentric welding rod problem. A thorough analysis of this problem led to this development of advanced design and applied science of electronics in measuring accurately the concentricity of welding rods. **The Graham-Mintel Instrument Company,** electronic engineers, worked hand in hand with The Moslo Machinery Company in developing this new electronic gauge to overcome the greatest problem in the coating of welding rods.

* * *

THE new Gauge uses a balanced circuit in which one rod is used for balancing, the other for measurement, and both rods should be taken from the same batch. Two "V" blocks are provided to steady any size rods for testing. The measuring pickups are located under the left "V" block and the right

one serves only as a support. Measurement is obtained by holding the rod to be measured in the left "V" block and by rotation of the rod.

* * *

THE meter is conveniently located above the "V" blocks and shows the eccentricity in .001 per inch increments. When the point is at right the high side of the coating will be on top. Also a fine adjustment is provided to shift the pointer position to any part on the scale which is most simple for operator to read. The instrument is automatically compensated for the different rod sizes and magnetic fluxes. No adjustment is necessary, however, where accuracies inside of .001 want to be reached. On rods having high magnetic fluxes a sensitivity control is provided which may be used to obtain absolute accuracies on that type of rod.

* * *

THE instrument being electrically fused insures safe operation at all times. The electronic tubes operate at approximately 1/3 of their safe capacity which means that the life of the tubes is greatly extended.

* * *

ONE of the many fine features of the Gauge is that it can be used for rod inspection to check the quality of welding rods during and after the manufacturing process. This instrument can be furnished in 115 volt, sixty cycle or, other voltages upon request.

* * *

New Metallizing Development

A new method for hard-facing by using a metallizing gun and METCO-WELD H, a "wire" compound of a powdered hard-facing alloy extruded with a plastic binder, has been announced by Metallizing Engineering Co., Inc., Long Island City, New York.

* * *

THIS Sprayweld method attains the previously difficult objective of applying smooth, uniform, relatively thin hard coatings, in a highly practical and inexpensive manner.

* * *

DURING the spraying operation, the plastic binder is completely

The comprehensive program of the annual convention of the Wire Association in Chicago, October 20-23, will doubtless be a great contribution to the advance of the wire industry in which we are all so deeply interested.
JOHNSON
STEEL AND WIRE COMPANY, INC.
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NEW YORK AKRON DETROIT CHICAGO LOS ANGELES TORONTO

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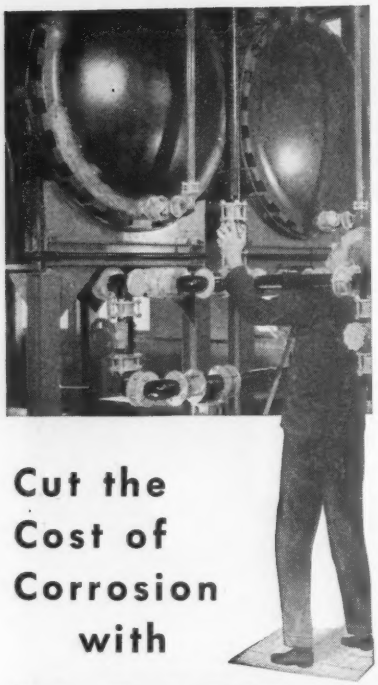

Cut the Cost of Corrosion with

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Process Equipment

Solid, structural, molded HAVEG insures the long life of chemical equipment because of its resistance to acids and alkalies through its entire mass.

Not being a lining or coating, surface abrasions and scratches cannot destroy or even slightly affect its effectiveness.

HAVEG piping and fittings are stocked in sizes from ½" to 12" I.D. and fume duct from 2" to 36" I.D. Tanks 10' in diameter and 12' high, as well as other equipment, can be made to your specifications at low cost.

Send for Bulletin F-5 for full data.

HAVEG CORPORATION
NEWARK 47, DELAWARE

volatilized, and the deposit consists entirely of the metallic constituent. Subsequent fusing, with any fusing torch or with an attachment on a METCO metallizing gun, results in a coating alloyed to the base and physically and chemically identical to hard-facings of the same alloy applied by other methods.

* * *

THE alloy used in METCO-WELD H is unique in many respects. It possesses excellent resistance to abrasion —will outwear hardened steel 3 to 10 times for this type of service. It resists corrosion better than stainless steel under most of the conditions for which stainless is generally used. It combines a low melting point with a long range of plasticity (1850° to 2050°F.) It has high strength at red heat and exceptional resistance to oxidation.

* * *

BULLETIN 53 explaining the operation and advantages of the Sprayweld process is available upon request to the Metallizing Engineering Co., Inc., Long Island City, New York.

* * *

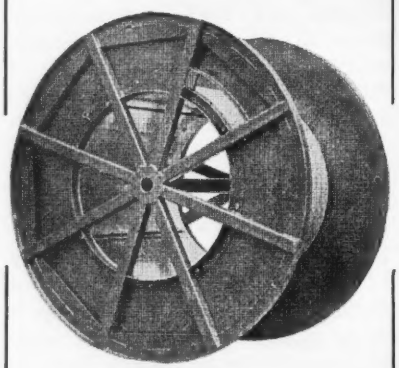
I. D. A. Issues Hardness Chart

THE Industrial Diamond Association of America, Inc., 501 Lexington Avenue, New York 17, N. Y., has created a new Hardness Chart, in connection with an important series of articles in Trade Journals on The Use and Care of Diamond Tools. This Chart, by means of bar graphs, gives a quick, clear, comparison of the hardness of diamond with other minerals, using the scientific results of scientific abrasion tests and indentation tests and comparing both scales with the commonly used Mohs scale. The physicist, Mohs, (1772-1839) produced a useful comparison "scale" for the hardness of minerals, but it did not pretend to indicate the relative degrees of hardness. This has engendered erroneous impressions in the minds of many well-educated engineers as to the relative hardness of diamonds, which is many times more than that of the next hardest natural substance, corundum (sapphire).

* * *

All Steel Reels

FOR SHIPPING
FOR STORING
CABLE AND WIRE



Last Longer

Constructed of corrosion resisting materials, three to four times the life of a wooden reel is a reasonable expectancy.

Give Greater Protection

Smooth inner surfaces, much greater strength with the absence of all cutting or abrading projections—these protect not only the cable but the men handling it.

Save Our Freight

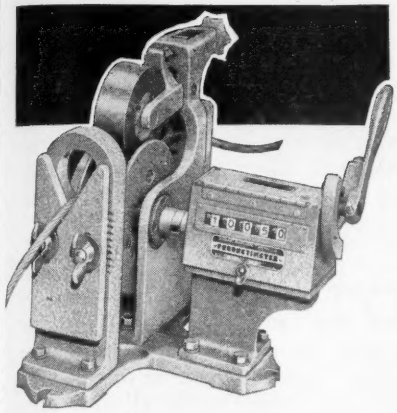
Appreciably lighter than wooden reels—cost less to ship—a cumulative saving that more than offsets increased first cost.

Reduce Investment

The longer life of R. B. Hayward Steel reels reduces the investment in reel equipment.

Write for description of construction and prices.

R. B. Hayward Co.
1714 Sheffield Ave., Chicago, Illinois



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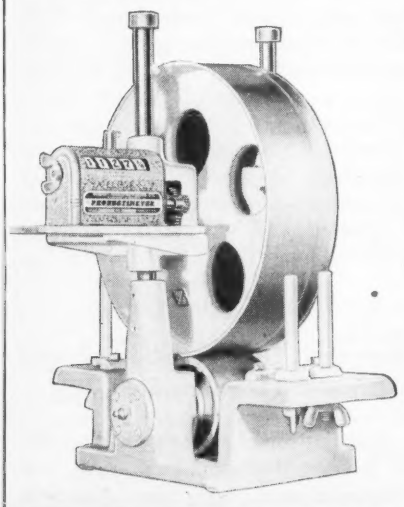
assure accurate count in all wire processing!

In the Productimeter line . . . the most complete offered the Wire Industry . . . you'll find just the unit you need for keeping count of production . . . for measuring bare or covered wire and cable, up to 3" diameter, at 1000 to 5000 feet per minute . . . for braiding operations . . . for stripping, cut-off machines, and reeling operations.

Other models for counting operations and parts are Predetermined, Stroke, Rotary, and Electrically operated Productimeters.

Our new General Catalog, with illustrations, descriptions and specifications, will give you a ready reference to the broad line of Productimeters, including No. 40 on the Wire Measuring Units shown here. Send for your copy today!



DURANT MANUFACTURING CO.
1918 N. Buffum St. Milwaukee, Wis.
176 Eddy Street Providence, R.I.

THE chart shows diamond to be over four times as hard as any other natural mineral. The importance to modern industry of industrial diamonds and their constantly increasing uses, demand that there be no question as to the actual relative toughness of diamond. This clarification, the Industrial Diamond Association now accomplishes by its present publication of the chart.

* * *

Cambridge Making New Metal Sling

THE Cambridge Wire Cloth Company, Cambridge, Md., has issued Bulletin No. 88 describing and illustrating a new flexible metal sling for handling pipe, tubing, bars, rods and shapes in pickling, annealing and conveying operations.

* * *

THESE slings are made of acid resisting metal and are offered in standard sizes or made to special order as to metal or size. Copies on request.

* * *

New Electrodes for Welding Alloy Steel

THE Eutectic Welding Alloys Corporation announces that EutecTrodes 67 AC and 670 DC have been added to the "Low Temperature" EutecTrode Series.

* * *

EUTECTRODES 67 AC and 670 DC have a high alloy content developed for joining, filling, filleting and overlaying all types of steel where high tensile and impact strength; good heat, corrosion, and wear resistance; and high hardness values are required. It can also be used as an overlay material on cast iron. Many use it as a universal steel electrode.

* * *

THIS alloy is especially useful for rebuilding chemical agitator beads, welding of stay bolts, salt-water pipe lines, and similar parts that are exposed to extensive corrosive action. It is fast flowing, smooth operating with no spatter, and free from undercutting. The weld metal can be deposited at the highest possible speed and with the least amount of base heat.

NEW!

ROOS MACHINES for the DIE ROOM

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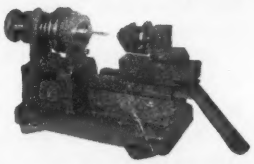
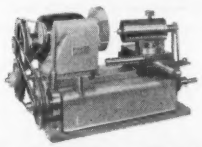
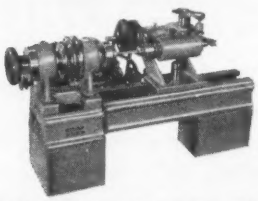


- **ROOS PRECISION PIN GRINDER**



- **ROOS AUTOMATIC POLISHERS**



A COMPLETE LINE OF LAPPING MACHINES, DRILLERS AND POLISHERS TO SPEED UP PRODUCTION IN YOUR

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GALVANIZING FLUX

No wonder H-VW-M No. 20 Galvanizing Flux—the first patented flux successful in hot galvanizing—is pronounced by so many galvanizers—"finest for the work." Years of experiments, years of study, produced H-VW-M No. 20—a flux "tailor made" to give a superior zinc adherence—a smooth, ductile coating and to reduce dross.

See for yourself what advantages No. 20 offers. For details, drop H-VW-M a line. Or ask for an H-VW-M engineer to call in person. It's likely his knowledge of problems like yours will lower operating costs, improve your product, and give you increased simplicity and control in hot galvanizing. OST #2465

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MATAWAN, NEW JERSEY
Manufacturers of a complete line of electroplating and polishing equipment and supplies
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SINCE 1820

THE CRUM CALCULATOR for Wire Drafting

Provides answers simply and accurately for a given mathematical wire drafting problem. One setting shows number of holes, percentage of draft per hole, total reduction in area and intermediate die sizes to be used. Universality: Because of the circular scale there are neither upper nor lower limits on the diameters that the calculator can be used for.

The Crum calculator is designed especially for wire drawing jobs involving eight or fewer drafts. Problems involving a greater number of drafts can be solved, however, with extra manipulation. For instance, if it is desired to set up a multi-draft machine to draw .0095 inch diameter wire from .0625 inch stock in sixteen drafts, the intermediate die sizes can be determined by the calculator.

HOW TO ORDER

The price is $5.00 each. A discount of 10% on ten or more. Send check or purchase order to

WIRE AND WIRE PRODUCTS
300 MAIN STREET STAMFORD, CONN.

Wire Conditions in Scotland

SHORTAGE of wire and of labour and the biggest volume of business ever experienced, are combining to throw Scottish wireworking firms further and further into arrears with orders.

* * *

ONE major section of trade is the production of burglar guards for retail shops; these are being uniformly specified by insurance companies for all new burglary policies, while for many established policy holders, insurance companies are now asking similar protection. The net result has been to throw a continued and major pressure on every firm in the industry.

* * *

WERE wire, rod and skilled workers freely available the job would be relatively easy. But none of these essentials are in fact available in the desired volume and work consequently slips further and further into arrears. The recent acute shortage of wire, in consequence of the power cuts in the North of England, has still further increased the tightness.

* * *

FIRMS ordered by their insurers to fit guards are pleading with the wireworkers to effect the necessary protection. Difficulty is often to persuade a firm to accept the new work, and where accepted it has been, in some instances, delayed for a considerable period before the wireworkers could even measure up and estimate. Delivery varies considerably, but three to five months is a normal period, in some instances. A great deal of other wirework is presently, perforce, neglected and will all have to be tackled some day.

* * *

Improved Electropolishing Process for Stainless Steel

AN improved electropolishing process for stainless steel was demonstrated by **The American Rolling Mill Company** at the recent Industrial Finishing Exposition in Detroit. The exposition was held in

connection with the American Electroplaters Society Convention.

* * *

ESSENTIALLY the process is the reverse of electroplating. The stainless steel is the anode, and metal is removed. In electroplating the work is the cathode, and metal is deposited.

* * *

AT the convention a miniature lead-lined electropolishing tank was used as a demonstrator. On cold-drawn stainless steel wire products only 2 to 8 minutes' time in the tank was necessary for a good polish. Rough surfaces, as in the case of castings and forgings, require slightly longer periods. The amount of metal removed is very small, usually only a half-thousandth to a thousandth of an inch.

* * *

THE solutions used with these patented processes are: Citric-sulphuric acid, gycolic-sulphuric acid, and phosphoric acid-butyl alcohol solution. In operation, the solution temperature is held between 185° and 200°F. Sludge precipitating in the polishing process is removed periodically. The phosphoric acid-butyl alcohol solution differs in that it operates at about 140°-160° and precipitates a slime.

* * *

THE current density for electropolishing is about the same as for electroplating. One-half to one ampere per square inch gives the best results in two solutions, but 1-1½ amperes should be used for phosphoric acid-butyl alcohol. A direct current source of 6 to 12 volts is sufficient to polish any parts.

* * *

ACCORDING to the demonstrators, an important advantage of electropolishing lies in cutting polishing costs on certain products. They pointed out that in the case of small and intricately-formed products the cost of mechanical polishing is often prohibitive. But with electropolishing an extremely thin layer of metal is removed from the whole surface. This gives the entire product a brilliant lustre and solves the prob-

WIRE MANUFACTURING MACHINES

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DRAWING — ANNEALING — TINNING — ENAMELING
STRANDING — SPOOLING — COILING

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We Will Build Machines To Your Specifications

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WOOD -- PLYWOOD -- WOOD-METAL

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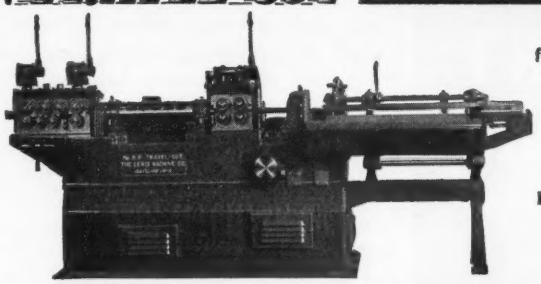
Samples and Prices on Application

DURKEE MFG. CO. **PINE RIVER, MINN.**

LEWIS TRAVEL-CUT WIRE STRAIGHTENING and CUTTING Machines



Machines for 1/16" to 3/4" rod
Round
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Ferrous and Non-Ferrous

Automatic
High Speed
Heavy Duty

LEWIS

The LEWIS MACHINE Co., 3445 E. 76 St., Cleveland, O.

WIRE SPOOLING MACHINES

The Charles P. Boyd Corporation now manufactures the high quality wire spoolers formerly made by the Fidelity Machine Company

Reasonable deliveries made

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WIRE CUTTING MADE EASY

Hard wire*, spring wire, as well as soft wire, wire fabric, tie wire, fencing, etc. — easily and quickly cut with a porter tool. A standard model for average needs. Special models for special work.

Send for catalog showing all Porter models of wire cutters, bolt clippers, etc.

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PORTER HKP CUTTERS

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WIRE
FLATTENING MILLS
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WIRE SPOOLERS
DRIVEN BY
HYDRAULIC Power Operated Fluid Motors for Almost Any Speed Range with Perfect Tension Control.

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up to 300% longer die life

By imparting a fine grain crystalline phosphate coating that absorbs and retains die lubricants, the Oakite CrysCoat Process protects both dies and work. But that's only one of 5 advantages you get by using the Oakite CrysCoat Process to pre-coat rods before liming. Here are the others:

Cut in Baking Time
More Passes before Annealing
Protection Against Rust
Brighter Wire

Your Oakite Technical Service Representative will gladly show you how the Oakite CrysCoat Process lends itself to trouble-free production of high quality wire. Contact him today.

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Technical Representatives in Principal Cities of U. S. & Canada

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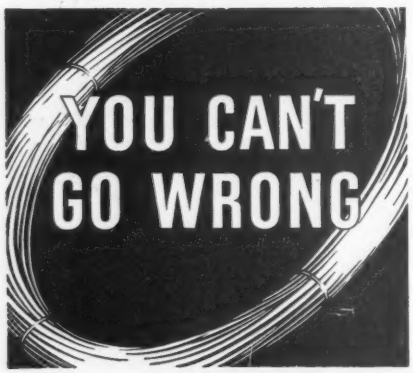
Specialized Industrial Cleaning
MATERIALS • METHODS • SERVICE



No matter what you make—if there's low carbon wire in it, you can't go wrong if you use Wickwire Cortland wire.

Back of every foot of this wire is over 70 years of wire-making experience. There's a size and style for every purpose.

WICKWIRE BROTHERS, INC.
CORTLAND, N. Y.

Cortland BRANDS

lem of polishing hard-to-reach crevices and recesses. When polishing small deep-drawn products cathodes of special design may be used.

* * *

SOMETIMES the product may need mechanical work before electropolishing to remove grinding marks and deep scratches. Electropolishing exaggerates these imperfections; yet even on rough surfaces electropolishing produces a bright finish.

* * *

THIS process is said to be excellent for polishing stainless steel wire products such as refrigerator shelves, meat racks and kitchen tools. It removes light weld scale and discoloration such as that resulting from resistance welding.

* * *

AN illustrated folder giving additional information may be obtained by writing The American Rolling Mill Company, Middletown, Ohio.

* * *

EASTWOOD WIRE
CENTRIFUGALLY-CAST FOR QUALITY
Belleville • New Jersey

PHOSPHOR BRONZE
NICKEL SILVER
WIRE
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FLAT WIRE

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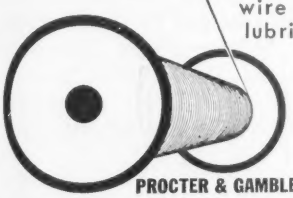
CORPORATION
BELLEVILLE 9, NEW JERSEY

FOR MAXIMUM "MILEAGE" AND FINISH CONTROL IN YOUR WIRE DRAWING OPERATIONS USE P&G SOAPS

For drawing both ferrous and alloy wires—in either dry or wet operations — you can depend upon these important qualities in Procter & Gamble soaps:

Excellent Adherence
Efficient Lubrication
Minimum Dusting
Uniformity
Economy

One of our representatives will be glad to discuss wire drawing lubricants with you.



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SCIENTIFIC LUBRICATION
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Line of Lubricants
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Rolling Mill and Wire Mill
Operations

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Weatherproof and Flame
Resistant
Finishing Compounds

Synthetic Resins

Our Research Staff
Welcomes Your Problems

THE IRONSIDES COMPANY
COLUMBUS 16, OHIO

New Catalog On Die-Less Duplicating

AN entirely new catalog, No. 47-12 has been put out by **O'Neil-Irwin Manufacturing Company,** Lake City, Minn., which gives 40 pages of information on the newly designed Di-Acro machines and their use. A copy of this book will be sent to anyone of our readers for the asking. It covers benders, brakes, shears and rod parters made by the company.

World Wide Wire Industry
Belgium

(*Continued from page* 782)

THE Belgian Wire Works are also manufacturing at present nearly every quality of hard steel wire for the various industrial purposes: rope wire, spring wire, brush wire, card wire, pre-stressed concrete wire, oil-hardened wire, etc.

* * *

AS to the equipment of the Belgian Wire Mills, most of the works had made a very serious effort, especially in the last years preceeding the outbreak of the war, to modernize their machinery. But owing to the war, Belgium has been cut off for nearly six years from the rest of the world and it is very likely that important progress has yet to be achieved. We think that this question of modernization and technical progress will be a very serious problem to all the Belgian Wire Manufacturers for the first months and perhaps years to come.

* * *

TOWARDS the end of 1945, two members of our technical staff went to U.S.A. and England and had an opportunity to get acquainted with the huge progress made in those two countries.

* * *

THE Belgian wire drawers are taking steps to organize their works on competitive bases. They are well aware of the fact that owing to the increase of wages in Belgium, economy of labour should be realized wherever it can possibly be done.

* * *

THE Belgian wire works are spread somewhat all over the country, as there are factories in Flanders and in the provinces: Ant-

ACID AND ALKALI PROOF
LININGS AND MORTARS

ACID PROOF
CONSTRUCTION

THE CEILCOTE CO.
Consulting and Research Engineers
750 ROCKEFELLER BLDG.
CLEVELAND, OHIO

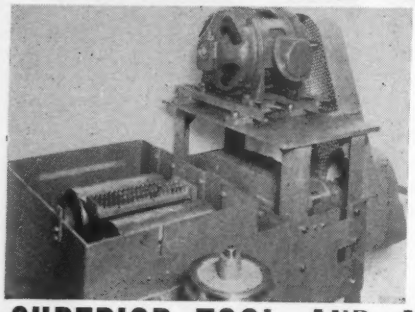
BORAX
for
Wire Drawing

After pickling, BORAX can be applied with one dip; dries in three minutes in an oven temperature of 150° F. to provide a coating that will not check or flake off in storage. Dissolves readily in water and is dust free. BORAX, other than being an excellent vehicle for picking up the drawing lubricant, is rust inhibiting and a natural flux that will facilitate the making of good butt welds. Use BORAX to make better wire at less cost. Used in many mills.

Send for complete particulars

PACIFIC COAST BORAX CO.
51 Madison Ave., New York 10, N.Y.

CONTINUOUS WIRE DRAWING MACHINE



for low carbon, high carbon and alloy wires, with provision for twenty drafts. Spooling attachment furnished if desired.

Also makers of other wire drawing machines, wire mill accessories such as spoolers, straighteners, pointers and water cooled die holders, and special machinery.

Write for particulars

SUPERIOR TOOL AND MANUFACTURING CO.
172 UNION STREET WORCESTER, MASS.

IMPROVE ACID PICKLING

RAPID HEATING • *FASTER PICKLING*

EFFECTIVE AGITATION • *UNIFORM SCALE REMOVAL*

use Heil Steam Jets

HEIL PROCESS EQUIPMENT CORP.
Cleveland 11, Ohio

ANCHOR WIRE CORPORATION
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JAMAICA 3, L.I., NEW YORK

NON-FERROUS **WIRE** *FERROUS*

COILING SPOOLING **SPECIALISTS** STRANDING BRAIDING

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CARBIDE DIES for DRAWING ROUNDS,
SPECIAL SHAPES, TUBING, COLD HEADING, EXTRUSION,
EYELET, ETC. ALSO, RECUTTING and POLISHING

QUALITY WORKMANSHIP FOR LONG
DIE LIFE BY EXPERT DIE MEN

Prompt Service

MILLBURY DIE COMPANY
Martin Street Millbury, Mass.

werp, Hainaut and Brabant. The map gives an idea of the repartition of the different wire mills and their approximate situation.

* * *

THE Belgian Industry is represented today by nearly a dozen of works of different capacity, but all grouped into one Union, namely the **"Union des Trefileries & Clouteries Belges".** This central selling organization has its offices in Brussels: 54, Rue de Namur, and is now selling wire and wire products on the home market and also on the various export markets.

* * *

SOME of the Belgian works had already concentrated their sales in the hands of a central office in 1926. In 1932, this sales-organization was enlarged under its present denomination: **Union des Tréfileries et Clouteries Belges,** by the adhesion of ALL Belgian Wire Manufacturers, so that the U.T.C.B. became really a National Union representing the whole Belgian Wire Industry.

The Copper and Copper Alloy Wire Industry in Great Britain

(*Continued from page* 785)

turers have of necessity developed specialized practices to fit in with the peculiarities and limitation of their own plant, which is readily understandable when it is remembered that most of the copper rod mills are of considerable age, having been modified at various times to provide outputs perhaps up to four times those for which they were originally designed. Mills also vary considerably in size from say being able to roll 135 lb. wire bars only, to a mill capable of handling bars up to 2,240 lb. in weight.

* * *

SPECIAL attention has been given to the improvement of wire finish, for instance by scalping the wire at an early stage of drawing from the rod. Attention has also been focussed on the effect of surface quality on fatigue strength, particularly in the case of trolley wires.

* * *

IN regard to the fabrication of copper alloys, cold rolling, hot rolling and extrusion are currently in use

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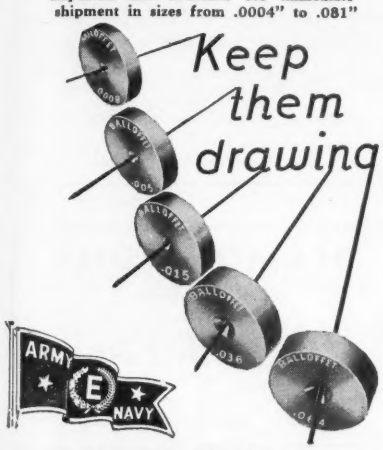

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for the initial stages. A modern tendency has been the application of extrusion and hot rolling in the case of tin bronze alloys of high purity, though this is by no means universal.

* * *

WIRE drawing machinery has been very considerably improved; in particular drawing speeds have been much increased, and heavier total reductions have been made possible. The use of tungsten carbide dies is now almost universal for the larger sizes of wire.

* * *

COINCIDENT with the improvement in machine design, there have been developments in mechanical handling facilities. The size of reels has been increased at all stages of drawing, so that operations are now more and more approaching a continuous basis. In the case of copper, the reel capacities have been increased to as much as two tons of wire for the heaviest gauges.

* * *

INTERSTAGE annealing in the fabrication of copper has now been eliminated except in the case of a few plants. Many developments have taken place in plant for final annealing and, except for heavy gauge wire, all annealing is now carried out in electric furnaces with controlled atmospheres. For the annealing of fine copper alloy wires, particularly bronzes, continuous tubular furnaces are thought to have considerable advantages.

* * *

A notable development in England during the last few years has been the setting up of a diamond die industry. This is now on a firm basis, and the country is independent of supplies of diamond dies from Continental countries, as was formerly the case.

Wire Industry in India

(*Continued from page 796*)

THE Indian businessman is shaking off his conservation. He wants to expand his business; replace old machinery with modern equipment. He needs lots of skilled

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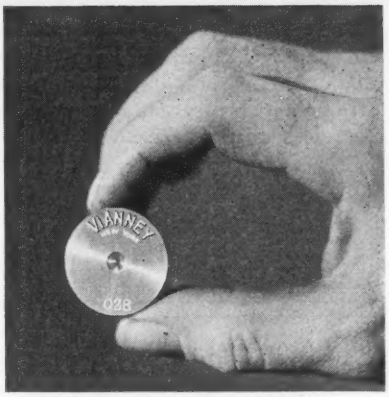

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labor and machinery. Germany and Japan have been completely wiped off from the Indian market. This great vacuum created in the Indian trade can only be filled by U. K. or United States. Here is a golden opportunity for both United States and India to have direct trade relations. Although there are many hurdles to be cleared, nevertheless there is a great potential market.

IRELAND

By Frank O'Neill, Dublin, Ireland

At the present moment there is very little fabrication of wire in Ireland outside of screws, nails and seat springs, and wire is drawn only in two places and that to a very limited extent. In fact, it is only used for the production of the three articles mentioned. All wire for agricultural purposes is imported from England. Whilst there are intentions of increased wire drawing and fabrication, nothing will materialize for three to five years.

Wire Industry in Sweden

(*Continued from page* 801)

for Sound Recording, Brush Wire, Music Wire, Stainless Steel Wire in Spring Steel hardness and in softer states etc. In the flat wire field may be mentioned Flat Wire for Piston Ring Expanders and for Segment Type Piston Rings, Flat Wire for high tensile strength Chain Links etc.

* * *

STATISTICS pertaining to the last few years are not available but the foregoing statement gives some figures regarding production, export and import during the years 1936-1939 and 1942-1943 of Wire Rods, cold drawn Wire and certain kinds of wire products.

* * *

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* * *

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Standard Industrial Compounds Co., Chicago, Ill.

COMPOUNDS—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Bick, Hans Co., Inc., Reading, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H. Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Pacific Coast Borax Corp., New York, N. Y.
Potter, Neil C., Newark, N. J.
Standard Industrial Compounds Co., Chicago, Ill.

COPHOLDERS—Steel
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Wire & Textile Machinery Inc., Pawtucket, R.I.

CRANES—Wire Mill
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

CUTTING TOOLS—Carbide
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel & Carbide Co., McKeesport, Pa.
Vascoloy-Ramet Corp., North Chicago, Ill.

CUTTING TOOLS—Wire
Porter, H. K., Inc., Everett, Mass.

DIAMONDS—Industrial
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N.J.
Champion Diamond Co., New York, N. Y.
Michigan Wire Die Co., Detroit, Mich.
Rusch Wire Die Corp., Croton-on-the-Hudson, N.Y.
Vianney Wire Die Wks., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIAMOND POWDERS—
Champion Diamond Co., New York, N. Y.
Michigan Wire Die Co., Detroit, Mich.
New England Wire Die Co., Worcester, Mass.
Rusch Wire Die Corp., Croton-on-the-Hudson, N.Y.
Union Wire Die Corp., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIAMOND TOOLS—
Rusch Wire Die Corp., Croton-on-the-Hudson, N.Y.
Wayne Wire Die Co., Hillside, N. J.

DIES—Diamond
Ajax Industrial Supplies, Inc., Fort Wayne, Ind.
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N.J.
Cochaud Wire Die Corp., New York, N. Y.
Ft. Wayne Wire Die, Inc., Fort Wayne, Ind.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Michigan Wire Die Co., Detroit, Mich.
New England Wire Die Co., Worcester, Mass.
Rusch Wire Die Corp., Croton-on-the-Hudson, N.Y.
Union Wire Die Corp., New York, N. Y.
Vianney Wire Die Wks., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIES—Lead Extrusion
Eastern Tungsten Carbide Co., Newark, N. J.
Wayne Wire Die Co., Hillside, N. J.
Robertson, John, Co., Brooklyn, N. Y.

DIES—Repairs & Re-Cutting
Ajax Industrial Supplies Inc., Fort Wayne, Ind.
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N.J.
Carboloy Co., Detroit, Mich.
Cochaud Wire Die Corp., New York, N. Y.
Eastern Tungsten Carbide Co., Newark, N. J.
Firth-Sterling Steel & Carbide Co., McKeesport, Pa.
Ft. Wayne Wire Die, Inc., Fort Wayne, Ind.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
Michigan Wire Die Co., Detroit, Mich.
New England Wire Die Co., Worcester, Mass.
Rusch Wire Die Corp., Croton-on-the-Hudson, N.Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.
Williams A. R., Machy Co. Ltd., Toronto, Canada

DIES—Rod and Tube Drawing
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N.J.
Carboloy Co., Inc., Detroit, Mich.
Eastern Tungsten Carbide Co., Newark, N. J.
Firth-Sterling Steel & Carbide Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
Michigan Wire Die Co., Detroit, Mich.
Rusch Wire Die Corp., New York, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.
Williams, A. B. Machy, Co., Ltd., Toronto. Canada

DIES—Tantalum Carbide
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N.J.
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel & Carbide Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstoyn, Ohio.
Millbury Die Co., Millbury, Mass.
Rusch Wire Die Corp., Croton-on-the-Hudson, N.Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.

DIES—Tungsten Carbide
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N.J.
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel & Carbide Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, Ohio.
Millbury Die Co., Millbury, Mass.
Michigan Wire Die Co., Detroit, Mich.
Rusch Wire Die Corp., Croton-on-the-Hudson, N.Y.
Tungsten Alloy Mfg. Co., Newark, N. J.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.
Williams A. R., Machy Co. Ltd., Toronto, Canada

DIRECT ELECTRIC RESISTANCE HEATING—
Trauwood Engr. Co., Cleveland, Ohio.

DRAW BENCHES—
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J. Fdry. & Mach. Co., Trenton, N.J.
Vaughn Machinery Co., Cuyahoga Falls, O.

DRUMS—Flange Steel
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

DRUMS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.

DRYING & PRE-HEATING ROOMS—
Carl-Mayer Corp., The, Cleveland, Ohio.
Industrial Ovens, Inc., Cleveland, Ohio.

DRYING EQUIPMENT—
Carl-Mayer Corp., The, Cleveland, Ohio.
Ross, J. O., Engineering Corp., New York, N.Y.

WHERE TO BUY, Continued

ENGINEERS—Consulting Wire Mill
Lewis, Kenneth B., Worcester, Mass.
Syer, C. Raymond, Westport, Conn.

EQUIPMENT—Insulation Testing
Davis, R. L., Elec. Co., Wallingford, Conn.
Entwistle, James L., Co., Pawtucket, R. I.
Williams A. R., Machy Co. Ltd., Toronto, Canada

EYELETS—Brass or Zinc
Platt Bros., & Co., The, Waterbury, Conn.

FLUXES—Soldering
American Chemical Paint Co., Ambler, Pa.

FOAM PRODUCING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Parkin, Wm. M. Co., Pittsburgh, Pa.

FRICTION PAY-OFF STANDS—
Industrial Ovens, Inc., Cleveland, Ohio.

FURNACES—Annealing
Ajax Electric Co., Inc., Philadelphia, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Hayes C. I., Providence, R. I.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engr. Co., Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Automatic
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Surface Combustion Corp., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Brazing
Electric Furnace Co., Salem, Ohio.
Firth-Sterling Steel & Carbide Co., McKeesport, Pa.

FURNACES—Bright Annealing
Electric Furnace Co., Salem, Ohio.
Furnace Engineers Inc., Pittsburgh, Pa.
Surface Combustion Corp., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Electric
Eisler Engineering Co., Newark, N. J.
Electric Furnace Co., Salem, Ohio.
Hayes, C. I., Providence, R. I.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Galvanizing Equipment
Ajax Electric Co., Inc., Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Surface Combustion Corp., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Hard'ing & Temp'ing
Ajax Electric Co., Inc., Philadelphia, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engr. Co., The, Cleveland, Ohio.

FURNACES—Lead Melting
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Robertson, John, Co., Brooklyn, N. Y.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Non-Oxidizing
Ajax Electric Co., Inc., Philadelphia, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Normalizing
Ajax Electric Co., Inc., Philadelphia, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Pot (Oil, Gas, Electric)
Ajax Electric Co., Inc., Philadelphia, Pa.

FURNACES—Salt Bath
Ajax Electric Co., Inc., Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio.
Surface Combustion Corporation, Toledo, O.

FURNACES—Wire, Strip & Sheet
Carl-Mayer Corp., The, Cleveland, Ohio.
Eisler Engineering Co., Newark, N. J.
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Surface Combustion Corporation, Toledo, O.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

GALVANIZING EQUIPMENT—
Hanson-Van Winkle-Munning Co., Matawan, N.J.

GALVANIZING FLUXES—
Hanson-Van Winkle-Munning Co., Matawan, N.J.

GALVANIZING KETTLES—
National Annealing Box Co., Washington, Penna.

GRINDERS—Roll
Norton Co., The, Worcester, Mass.

HOISTS—Electric Travelling
Cleveland Tramrail Div. of Cleveland.
Crane & Engineering Co., Wickliffe, Ohio.

INHIBITORS—Pickling
American Chemical Paint Co., Ambler, Pa.
Oakite Products, Inc., New York, N. Y.
Parkin, Wm. M. Co., Pittsburgh, Pa.

INSULATING LACQUERING SYSTEMS—Continuous
Industrial Ovens, Inc., Cleveland, Ohio.

INSULATING MATERIALS—
Crepe-Kraft Co., Newark, N. J.
Du Pont de Nemours, E. I., Co., Wilmington, Del.
General Electric Co., Schenectady, N. Y.
Owens Corning Fiberglas Corp., Toledo, O.
Perfect Thread Co., Inc., Brooklyn, N. Y.
Standard Varnish Wks., Staten Island, N. Y.
Warren Thread Works, W., The, New York, N.Y.

KETTLES—Galvanizing, Annealing, Tinning, etc.
National Annealing Box Co., Washington, Penna.

LATHES—Die Reaming
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel & Carbide Co., McKeesport, Pa.
Morgan Construction Co., Worcester, Mass.
Roos, H. & G., Tool & Mfg. Co., Montclair, N.J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Machine Co., Waterbury, Conn.

LIME—
Warner Co., Philadelphia and Bellefonte, Pa.

LININGS—Acid and Alkali Proof
Ceilcote Co., The, Cleveland, Ohio.
Haveg Corp., Newark, Del.
Heil Process Equipment Corp., Cleveland, Ohio.

LUBRICANTS—For Metal Cutting, Stamping and Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Ironsides Co., The, Columbus, Ohio.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

LUBRICANTS—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Bick, Hans C., Inc., Reading, Pa.
Ironsides Co., The, Columbus, Ohio.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Potter, Neil C., Newark, N. J.
Standard Industrial Compounds Co., Chicago, Ill.

MACHINERY—Armoring (Cable, Wire Hose)
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Bale Tie
Reed & Richards Transatlantic Inc., New York, N.Y

MACHINERY—Braiding
Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Wire & Textile Mach'y, Inc., Pawtucket, R. I.

MACHINERY—Brazing
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Bunching
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Bundling, Scrap
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Cable, Electric
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Chain Making
Nilson, A. H. Machine Co., The, Bridgeport, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Cable, Rope Closing
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Coil Winding
Entwistle, Jas. L. Co., Pawtucket, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Coilers
Eisler Engineering Co., Newark, N. J.
Entwistle, Jas. L. Co., Pawtucket, R. I.
Laribee Machine Co., Inc., Camden, New York
Morgan Construction Co., Worcester, Mass.
National Machinery Exchange (used), New York, N. Y.
New England Butt Co., Providence, R. I.
Ruesch, H. J. Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Waterbury Farrel Fdry. & Mach. Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.
Wean Equipment Corp., Cleveland, Ohio.
Williams, A. R. Machy, Co. Ltd., Toronto, Canada
Wire & Textile Machinery Inc., Pawtucket, R. I.

MACHINERY—Cold Heading
Ajax Manufacturing Co., Cleveland, Ohio.

MACHINERY—Copper Wire Drawing and Rolling
Aetna Standard Eng'g Co., The, Youngstown, O.
American Insulating Mach'y Co., Phila., Pa.
National Machinery Exchange (used), New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Covering Wire
American Insulating Mach'y Co., Phila., Pa.
Royle, John & Sons, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Cutting
Ajax Manufacturing Co., Cleveland, Ohio.
Dore Manufacturing Co., Inc., Grayling, Mich.
Eisler Engineering Co., Newark, N. J.
Hallden Machine Co., The, Thomaston, Conn.
Lewis Machine Co., The, Cleveland, Ohio.
Moslo Machinery Inc., Cleveland, Ohio.
National Mach'y Exch. (Used), New York, N.Y.
Nilson, A. H. Machine Co., Bridgeport, Conn.
Porter, H. K. Inc Everett, Mass.
Shuster, F. B. Mfg. Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Die Making
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel & Carbide Co., McKeesport, Pa.
Roos, H. & G., Tool & Mfg. Co., Montclair, N.J.
Wayne Wire Die Co., Hillside, N. J.

MACHINERY—Draw Benches
Aetna Standard Eng'g Co., The, Youngstown, O.
Ajax Manufacturing Co., Cleveland, O.
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Edging
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Enameling
American Insulating Mach'y Co., Phila., Pa.
Industrial Ovens, Inc., Cleveland, Ohio.
Laribee Machine Co., Inc., Camden, New York
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Extruding
National Erie Corp., Erie. Pa.
Robertson John, Co., Brooklyn, N. Y.
Royle, John, & Sons, Paterson, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R. I

MACHINERY—Fence
Glader, Wm., Machine Works, Chicago, Il.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Filament Coil Winding
Eisler Engineering Co., Newark, N. J.

MACHINERY—Flat Wire
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Corp., Cleveland, Ohio.

WHERE TO BUY, Continued

MACHINERY—Forming
Eisler Engineering Co., Newark, N. J.
National Mach'y Exch. (Used), New York, N.Y.
Nilson, A. H., Machine Co Bridgeport, Conn.
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.
Reed & Richards Transatlantic Inc., New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Galvanizing
Wilson, Lee, Engr. Co., Cleveland, Ohio.

MACHINERY—Galvanizing Wire
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Equipment Co., Cleveland, Ohio.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

MACHINERY—Gang Winders
Entwistle, Jas. L. Co., Pawtucket, R. I.
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Grinding
Norton Co., The, Worcester, Mass.

MACHINERY—Insulating
American Insulating Mach'y Co., Phila., Pa.
National Erie Corp., Erie, Pa.
New England Butt Co., Providence, R. I.
Royle, John & Sons, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Lead Encasing Presses, etc.
Robertson, John Co., Brooklyn, N. Y.

MACHINERY—Lead Stripping
Robertson, John Co., Brooklyn, N. Y.

MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Magnet Wire
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Material Handling
Cleveland Tramrail, Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

MACHINERY—Measuring Wire & Cable
Durant Mfg. Co., Milwaukee, Wis.
Entwistle, Jas. L. Co., Pawtucket, R. I.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Nail and Tack
Glader, Wm., Machine Works, Chicago, Ill.
National Mach'y Exch. (Used), New York, N.Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Panning
American Insulating Mach'y Co., Phila., Pa.
Syncro Machine Co., Perth Amboy, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Pointing
Aetna Standard Eng'g Co., The, Youngstown, O.
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N.Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry & Mach. Co., Trenton, N.J.
Sleeper & Hartley, Inc., Worcester, Mass.
Superior Tool & Mfg. Co., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Rod Mill
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Rolling Mill
Morgan Construction Co., Worcester, Mass.
National Mach' Exch. (Used), New York, N.Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Rubber for Insulating Wire
Royle, John & Sons, Paterson, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Rubber Tubing and Straining
New England Butt Co., Providence, R. I.
Royle, John & Sons, Paterson, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Screw Wire
National Mach'y Exch. (Used), New York, N.Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Special
American Insulating Mach'y Co., Phila., Pa.
Emory, Robert J., Co., Newark, N. J.
Entwistle, Jas. L. Co., Pawtucket, R. I.
National Erie Corporation, Erie, Pa.
New England Butt Co., Providence, R. I.
National Rubber Machinery Co., Akron, Ohio.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry & Mach. Co., Trenton, N.J.
Sleeper & Hartley, Inc., Worcester, Mass.
Superior Tool & Mfg. Co., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Watson Machine Co., Paterson, N. J.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Spooling
American Insulating Mach'y Co., Phila., Pa.
Boyd Charles P., Corp., Philadelphia, Pa.
Eisler Engineering Co., Newark, N. J.
Emory, Robert J., Co., Newark, N. J.
Entwistle, Jas. L. Co., Pawtucket, R. I.
Laribee Machine Co., Inc., Camden, New York
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Equipment Co., Cleveland, Ohio.
Superior Tool & Mfg. Co., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
National Mach'y Exch. (Used), New York, N.Y.
Waterbury, Conn.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc., Pawtucket, R. I.

MACHINERY—Spring Making
National Mach' Exch. (Used), New York, N.Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Williams, A. R. Machy, Co. Ltd., Toronto, Canada

MACHINERY—Staple
Reed & Richards Transatlantic, Inc., New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Straightening
Ajax Manufacturing Co., Cleveland, O.
Dore Manufacturing Co., Inc., Grayling, Mich.
Hallden Machine Co., Thomaston, Conn.
Lewis Machine Co., The, Cleveland, Ohio.
Moslo Machinery Co., Cleveland, Ohio.
National Mach'y Exch. (Used), New York, N.Y.
Nilson, A. H. Machine Co., Bridgeport, Conn.
Ruesch, H. J., Machine Co., Newark, N. J.
Shuster, F. B., Mfg. Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Stranding
Hughesville Machine & Tool Co., Hughesville, Pa.
Laribee Machine Co., Inc., Camden, New York
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Strip Steel
Ruesch, H. J., Machine Co., Newark, N. J.
Steel Equipment Co., Cleveland, Ohio.
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Swaging
National Mach'y Exch. (Used), New York, N.Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Taping
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Testing Equipment—Sparkers
Davis, R. L. Elec. Co., Wallingford, Conn.
Entwistle, Jas. L., Pawtucket, R. I.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Tinning Wire
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Steel Equipment Co., Cleveland, Ohio.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Tinsel Rolling Mills
American Insulating Mach'y Co., Phila, Pa.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Trolley Wire
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Tube Mill
National Erie Corp., Erie, Pa.
Ruesch, H. J., Machine Co., Newark, N. J.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Welding Wire
Eisler Engineering Co., Newark, N. J.
Micro Products Co., Chicago, Ill.
Moslo Machinery Co., Cleveland, Ohio.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Winding
American Insulating Mach'y Co., Phila, Pa.
Boyd Charles P., Corp., Philadelphia, Pa.
Eisler Engineering Co., Newark, N. J.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wind-up (Constant Tension, Variable Speed)
Aetna Standard Eng'g Co., The, Youngstown, O.
Industrial Ovens, Inc., Cleveland, Ohio.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Bending
Eisler Engineering Co., Newark, N. J.
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

MACHINERY—Wire Drawing
Aetna Standard Eng'g Co., The, Youngstown, O.
Ajax Manufacturing Co., Cleveland, Ohio.
American Insulating Mach'y Co., Phila., Pa.
Eisler Engineering Co., Newark, N. J.
Laribee Machine Co., Inc., Camden, New York
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N.Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Equipment Co., Cleveland, Ohio
Superior Tool & Mfg. Co., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Wire Rope
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wood Screw
National Mach'y Exch. (Used), New York, N.Y.

MATERIAL HANDLING EQUIPMENT
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

MILLS—Tandem Rolling and Edging
Torrington Mfg. Co., Torrington, Conn.

NAILS—Wire
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Portsmouth Steel Corp., Portsmouth, Ohio.

NAILS & STAPLES
Pacific Atlantic Steel Corp., Los Angeles, Calif.

NICKEL SILVER AND PHOSPHOR BRONZE—Rod, Wire and Strip
Eastwood Really Corp., Belleville, N. J.
Hudson Wire Co., Ossining, N. Y.

OILS—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Procter & Gamble, Cincinnati, Ohio.
Standard Industrial Compounds Co., Chicago, Ill.

OVENS—Cable Lacquering
American Insulating Mach'y Co., Phila., Pa.
Industrial Ovens, Inc., Cleveland, Ohio.

OVENS—Dehydrogenizing
Carl-Mayer Corp., The, Cleveland, Ohio.
Industrial Ovens, Inc., Cleveland, Ohio.

OVENS—Industrial
Carl-Mayer Corp., The, Cleveland, Ohio.
Industrial Ovens, Inc., Cleveland, Ohio.
Ross, J. O., Engr. Corp., New York, N. Y.

WHERE TO BUY, Continued

OVENS—Welding Rod Coating
Carl-Mayer Corp., The, Cleveland, Ohio.
Industrial Ovens, Inc., Cleveland, Ohio.
Moslo Machinery Co., Cleveland, Ohio.
Ross, J. O., Engr. Corp., New York, N. Y.

PAINTS—Heat Resisting
American Chemical Paint Co., Ambler, Pa.

PAINTS—Marine
American Chemical Paint Co., Ambler, Pa.

PAINTS—Structural Steel
American Chemical Paint Co., Ambler, Pa.

PANS—Lead and Spelter
National Annealing Box Co., Washington, Penna.

PANS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.

PAPER—Creped Wrapping
Crepe-Kraft Co., Newark, N. J.

PAPER—For Coil Wrapping and Corrosion Prevention
Crepe-Kraft Co., Newark, N. J.

PAPER TESTERS—
Scott Testers, Inc., Providence, R. I.

PATENT ATTORNEYS—
Lancaster, Allwine and Rommel, Washington, D.C.

PICKLING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Oakite Products, Inc., New York, N. Y.
Parkin, Wm. M., Co., Pittsburgh, Pa.

PICKLING TANK LININGS—
Ceilcote Co., The, Cleveland, Ohio.
Haveg Corp., Newark, Del.
Heil Process Equipment Corp., Cleveland, Ohio.
Sauereisen Cements Co., Pittsburgh, Pa.

PIPES & FITTINGS—Acid Resistant
Ceilcote, Co., The, Cleveland, Ohio.
Haveg Corp., Newark, Del.
Heil Process Equipment Corp., Cleveland, Ohio.

PLASTIC TESTERS—
Scott Testers, Inc., Providence, R. I.

POTS—Lacquer
Industrial Ovens, Inc., Cleveland, Ohio.

POTS—Lead Melting
National Annealing Box Co., Washington, Pa.
Robertson, John, Co., Brooklyn, N. Y.

POWDER—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Inc., Homer, N. Y.
Potter, Neil C., Newark, N. J.
Standard Industrial Compounds Co., Chicago, Ill.

PRESSES—Hydraulic and Mechanical
Robertson, John, Co., Brooklyn, N. Y.

PRESSES—Lead
Robertson, John, Co., Brooklyn, N. Y.

PRESSURE VESSELS—
National Annealing Box Co., Washington, Penna.

PULLERS—Wire
Scudder, E. J., Fdry. & Mach. Co., Trenton, N.J.
Sleeper & Hartley, Inc., Worcester, Mass.

PUMPS—Hydraulic
Robertson, John, Co., Brooklyn, N. Y.

REEL AND TENSION STAND—
Industrial Ovens, Inc., Cleveland, Ohio.
Moslo Machinery Co., Cleveland, Ohio.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

REEL CRUTCHES—
Watson Machine Co., Paterson, N. J.

REELS—Annealing and Stranding
Apco Mossberg Co., Attleboro, Mass.
Boyd, Charles P., Corp., Philadelphia, Pa.
Hayward, R. B. Co., Chicago, Ill.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Moslo Machinery Co., Cleveland, Ohio.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS—Collapsible
Entwistle, Jas. L. Co., Pawtucket, R. I.

REELS—Steel
Apco Mossberg Co., Attleboro, Mass.
Hayward, R. B. Co., Chicago, Ill.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS AND SPOOLS—Shipping and Shop
Apco Mossberg Co., Attleboro, Mass.
Bridge Mfg., Co., The, Hazardville, Conn.
Hayward, R. B. Co., Chicago, Ill.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS—Takeoff
Apco Mossberg Co., Attleboro, Mass.
Bridge Mfg. Co., Hazardville, Conn.
Hayward, R. B., Co., Chicago, Ill.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Moslo Machinery Co., Cleveland, Ohio.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Shuster, F. B., Mfg. Co., New Haven, Conn.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS—Vulcanizing & Impregnating
Apco Mossberg Co., Attleboro, Mass.
Hayward, R. B., Co., Chicago, Ill.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS—Wire Drawing
Apco Mossberg Co., Attleboro, Mass.
Hayward, R. B., Co., Chicago, Ill.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Moslo Machinery Co., Cleveland, Ohio.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS—Wooden
Bridge Mfg. Co., Inc., The, Hazardville, Conn.
Durkee Mfg. Co., Pine River, Minn.

REFRACTORIES—High Temperature
Norton Company, Worcester, Mass.

ROD BAKERS—
Carl-Mayer Corp., The, Cleveland, Ohio.
Moslo Machinery Co., Cleveland, Ohio.
Ross, J. O., Engineering Corp., New York, N.Y.

RODS—Nickel Alloy
International Nickel Co., Inc., New York, N.Y.

RODS—Stainless Steel
American Rolling Mill Co., The, Middletown, O.
Rustless Iron & Steel Div., American Rolling Mill Co., Baltimore, Md.

RODS—Wire—Non-Ferrous
American Brass Co., The, Waterbury, Conn.
Eastwood Neally Corp., Belleville, N. J.
Hudson Wire Co., Ossining, N. Y.
Platt Bros. & Co., The, Waterbury, Conn.

RODS—Wire—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Indiana.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Portsmouth Steel Corp., Portsmouth, Ohio.
Roebling's John A., Sons Co., Trenton, N. J.
Youngstown Sheet & Tube Co., Younstown, O.

ROLL STRAIGHTENERS—
Moslo Machinery Co., Cleveland, Ohio.

ROPE—Wire
Bethlehem Steel Co., Bethlehem, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Roebling's, John A., Sons Co., Trenton, N. J.

RUBBER AND RUBBER COMPRESSION TESTERS—
Scott Testers, Inc., Providence, R. I.

RUST PROOF COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Oakite Products, Inc., New York, N. Y.

RUST REMOVING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Heil Process Equipment Corp., Cleveland, Ohio.
Standard Industrial Compounds Co., Chicago, Ill.

SATURATION SYSTEMS—
Industrial Ovens, Inc., Cleveland, Ohio.
Watson Machine Co., Paterson, N. J.
Wire & Textile Machy, Inc. Pawtucket, R. I.

SHEARS—
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

SHEET—Steel
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Youngstown Sheet & Tube Co., Youngstown, O.

SHIPPING TAGS—
Pacific Atlantic Steel Corp., Los Angeles, Calif.

SOAPS—Industrial and Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Bick, Hans C., Inc., Reading, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H. Co., Inc., Homer, N. Y.
Potter, Neil C., Newark, N. J.
Procter & Gamble, Cincinnati, Ohio.
Standard Industrial Compounds Co., Chicago, Ill.

SOLVENT RESIN SYSTEMS—Experimental
Industrial Ovens, Inc., Cleveland, Ohio.

SPOOLS—Annealing and Wire Drawing
Apco Mossberg Co., Attleboro, Mass.
Hayward, R. B., Co., Chicago, Ill.
Howsam Spool Company, Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

SPOOLS—Shipping and Shop
Apco Mossberg Co., Attleboro, Mass.
Clark, J. L., Mfg. Co., Rockford, Ill.
Hayward, R. B., Co., Chicago, Ill.
Howsam Spool Company, Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp.,

SPOOLS—Steel
Apco Mossberg Co., Attleboro, Mass.
Clark, J. L., Mfg. Co., Rockford, Ill.
Hayward, R. B., Co., Chicago, Ill.
Howsam Spool Company, Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

SPRINGS—Tools for Forming
State Machine Tool Co., Hartford, Conn.

STAMPINGS—Steel
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

STRIP—Brass and Non-Ferrous
Hudson Wire Co., Ossining, N. Y.

STRIP—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel & Carbide Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Roebling's, John A., Sons Co., Trenton, N. J.
Seneca Wire & Mfg. Co., The, Fostoria, Ohio.
Youngstown Sheet & Tube Co., Youngstown, O.

SWIFTS—Take-off
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Watson Machine Co., Paterson, N. J.

TANK LININGS—Brick
Ceilcote Co., The, Cleveland, Ohio.
Keagler Brick Co., Steubenville, Ohio.
Nukem Products Corp., Buffalo, N. Y.

TANK—Compound
Haveg Corp., Newark, Del.
Watson Machine Co., Paterson, N. J.

TANKS—Pickling
Ceilcote Co., The, Cleveland, Ohio.
Haveg Corp., Newark, Del.
Heil Process Equipment Corp., Cleveland, Ohio.
Nukem Products Corp., Buffalo, N. Y.
Sauereisen Cements Co., Pittsburgh, Pa.

TANKS—Steel
Mossberg Pressed Steel Corp., Attleboro, Mass.
National Annealing Box Co., Washington, Penna.

TOOLS—Spring Forming
State Machine Tool Co., Hartford, Conn.

TOOLS—Wire Cutting
Porter, H. K., Inc., Everett, Mass.

TRAMRAIL SYSTEMS—
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

TRAVERSES—For Reels
Entwistle, James L. Co., Pawtucket, R. I.
Hubbard Spool Company, Chicago, Ill.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

TRAVERSE MECHANISMS—
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.
Wire & Textile Machy, Inc. Pawtucket, R. I.

TREADS—Safety
Norton Co., Worcester, Mass.

WHERE TO BUY, Continued

TUBE BENDERS AND FORMERS—
Ruesch, H. J. Machine Co., Newark, N. J.

VALVES AND FITTINGS—Acid Resistant
Haveg Corp., Newark, Del.

VARNISHES—For Insulation
Standard Varnish Wks., Staten Island, N. Y.

VULCANIZERS—
Watson Machine Co., Paterson, N. J.

VULCANIZING PANS—
American Insulating Mach'y Co., Phila., Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.

WELDERS—Spot and Butt
Eisler Engineering Co., Newark, N. J.
Micro Products Co., Chicago, Ill.
Moslo Machinery Co., Cleveland, Ohio.

WIND-UP AND UNWIND SYSTEMS—Continuous
American Insulating Mach'y. Co., Phila., Pa.
Davis, R. L. Electric Co., Wallingford, Conn.
Entwistle, James L., Co., Pawtucket, R. I.
Industrial Ovens, Inc., Cleveland, Ohio.
Watson Machine Co., Paterson, N. J.
Wire & Textile Machy, Inc. Pawtucket, R. I.

WIRE—Aluminum
Aluminum Co. of America, Pittsburgh, Pa.
Malin & Co., Cleveland, Ohio.

WIRE—Barbed
Pacific Atlantic Steel Corp., Los Angeles, Calif.
Portsmouth Steel Corp., Portrmouth, Ohio.

WIRE—Cast
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Cold Heading
American Steel & Wire Co., Cleveland-Chicago, New York.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Laclede Steel Co., St. Louis, Mo.
Portsmouth Steel Corp., Portrmouth, Ohio.
Roebling's John A., Sons Co., Trenton, N. J.
U. S. Steel Export Co., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Electric
American Brass Co., The, Waterbury, Conn.
Hudson Wire Co., Ossining, N. Y.
Malin & Co., Cleveland, Ohio.

WIRE—Enameled for Coils
North American Philips Corp., Dobbs Ferry, N.Y.
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Manufacturers
American Steel & Wire Co., Cleveland-Chicago & New York.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel & Carbide Co., McKeesport, Pa.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Laclede Steel Co., St. Louis, Mo.
Nichols Wire & Steel Co., Davenport, Iowa.
Portsmouth Steel Corp., Portrmouth, Ohio.
Roebling's, John A., Sons Co., Trenton, N. J.
Rustless Iron & Steel Div., American Rolling Mill Co., Baltimore, Md.
Seneca Wire & Mfg. Co., The, Fostoria, Ohio.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.
U. S. Steel Export Co., New York, N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Spencer Steel Div., of Colorado Fuel & Iron Corp., Buffalo, N.Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Music
American Brass Co., The, Waterbury, Conn.
Ecca Machine Corp., New York, N. Y.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Malin & Co., Cleveland, Ohio.

WIRE—Nickel & Nickel Alloy
International Nickel Co., Inc., New York, N.Y.

WIRE—Nickel Silver and Phosphor Bronze
American Brass Co., The, Waterbury, Conn.
Hudson Wire Co., Ossining, N. Y.
Malin & Co., Cleveland, Ohio.

WIRE—Non-Ferrous to Specification for Special Purposes
American Brass Co., The, Waterbury, Conn.
Anchor Wire Corp., Jamaica, N. Y.
Hudson Wire Co., Ossining, N. Y.
North American Philips Co., Inc., Dobbs Ferry, N. Y.
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Spring
American Brass Co., The, Waterbury, Conn.
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Indiana.
Firth-Sterling Steel & Carbide Co., McKeesport, Pa.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Rustless Iron & Steel Div., American Rolling Mill Co., Baltimore, Md.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Stainless Steel
American Steel & Wire Co., Cleveland-Chicago-New York.
Columbia Steel Co., San Francisco, Calif.
Firth-Sterling Steel & Carbide Co., McKeesport, Pa.
Rustless Iron & Steel Div., American Rolling Mill Co., Baltimore, Md.
Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.
U. S. Steel Export Co., New York, N. Y.

WIRE—Steel—Also Coppered Steel—Also Galvanized Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Indiana.
Firth-Sterling Steel & Carbide Co., McKeesport, Pa.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
U. S. Steel Export Co., New York, N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Zinc
Platt Bros. & Co., The, Waterbury, Conn.

WIRE CLOTH—Industrial
Roebling's John A., Sons Co., Trenton, N. J.

WIRE SPOOLING—
Jersey Specialty Co., Little Falls, N. Y.

WIRE TESTERS—
Scott Testers, Inc., Providence, R. I.

WIRE, WEAVING—Non-Ferrous
American Brass Co., The, Waterbury, Conn.
Hudson Wire Co., Ossining, N. Y.
Portsmouth Steel Corp., Portsmouth, Ohio.

WRAPPING PAPER—Creped
Crepe-Kraft Co., Newark, N. J.

YARNS & TAPES—
Du Pont de Nemours, E. I., Co., Wilmington, Del.
General Electric Co., Schenectady, N. Y.
Owens Corning Fiberglas Corp., Toledo, Ohio.
Perfect Insulation Co., Inc., Brooklyn, N. Y.
W. Warren Barbour Co., The, New York, N. Y.

YARN TESTERS—
Scott Testers, Inc., Providence, R. I.

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PATERSON 3, NEW JERSEY, U. S. A.

Wire & Wire Products

October, 1947

ELECTRICAL WIRE AND CABLE AND WIRE ROPE MACHINERY

THREAD SERVING HEADS

AVAILABLE IN MANY SIZES AND COMBINATIONS. FOR COTTON, ASBESTOS, JUTE AND OTHER FIBROUS THREAD APPLICATIONS; ARRANGED FOR ANY NUMBER AND SIZE OF COPS. HIGHEST SPEEDS FOR THE SERVING OF CABLE, WIRE ROPE, HOSE, ET CETERA.

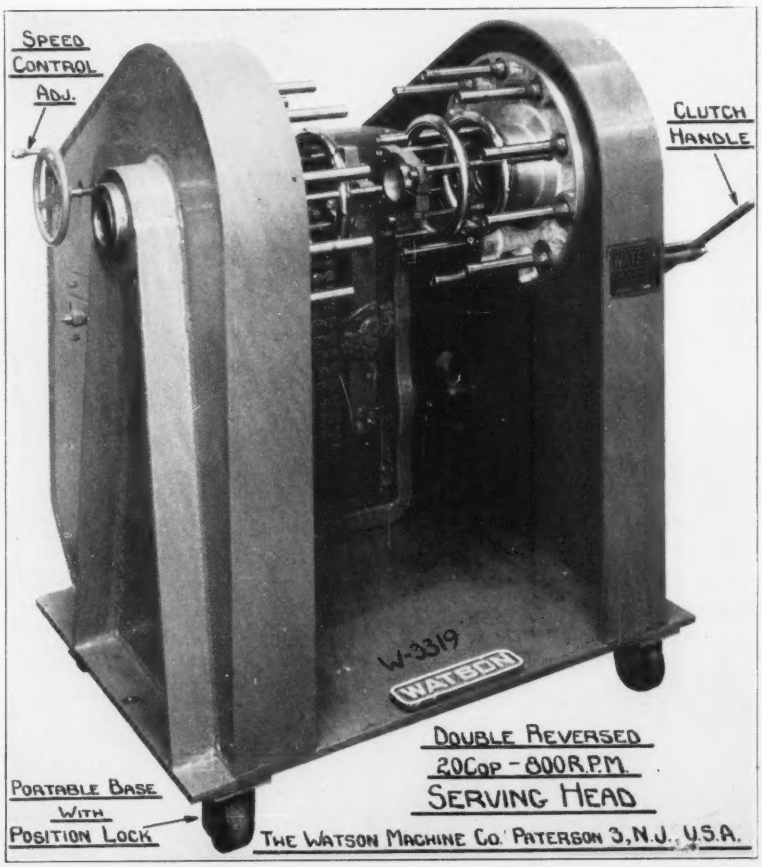
* * *

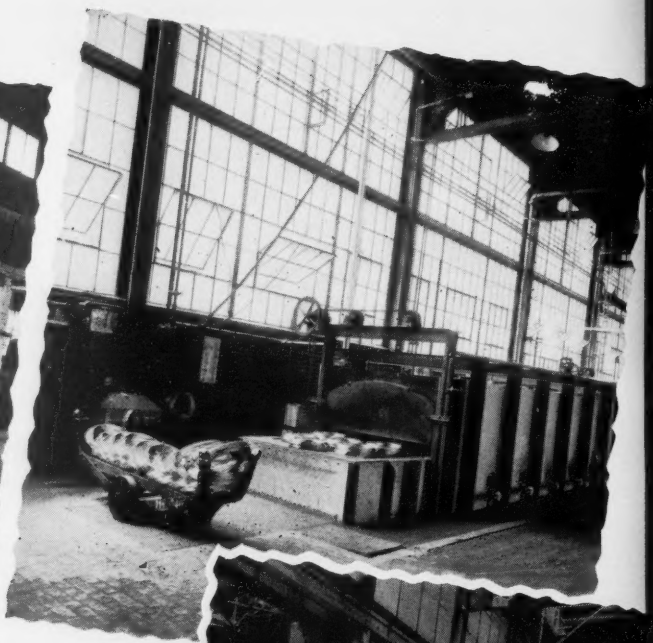
The unit illustrated and described here is an example of a recently executed design:

DOUBLE REVERSED 20-COP SERVING HEAD No. W-3319.

Primarily intended for the application of two layers of opposite wind of cotton thread for **Uncured Rubber Cable Coverage,** this head provides for:—

Highest possible speeds. — Minimum of space. — All Steel frame. — Reeves Variable Speed Transmission. — Silent V-Belt Drive. — Highest strength, heat treated, Aluminum Alloy disc construction. — Dynamic Balance. — Fully ball bearing disc assembly, including cop spindles. — Disconnecting Clutch. — Portable Mount. — Single, rapid and uniform tension adjustment for all ten threads simultaneously. — Adjustable die holders and thread lay heads.





EF

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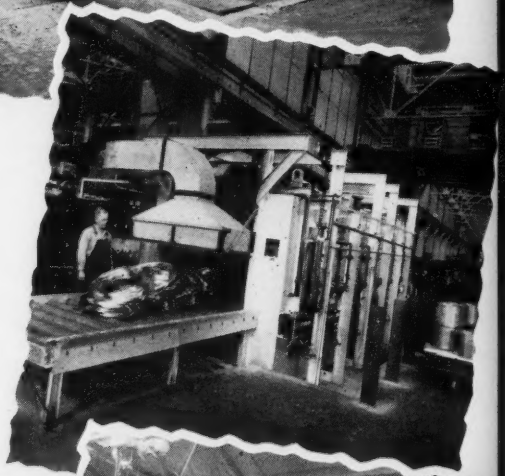
and ELECTRIC FURNACES



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EF

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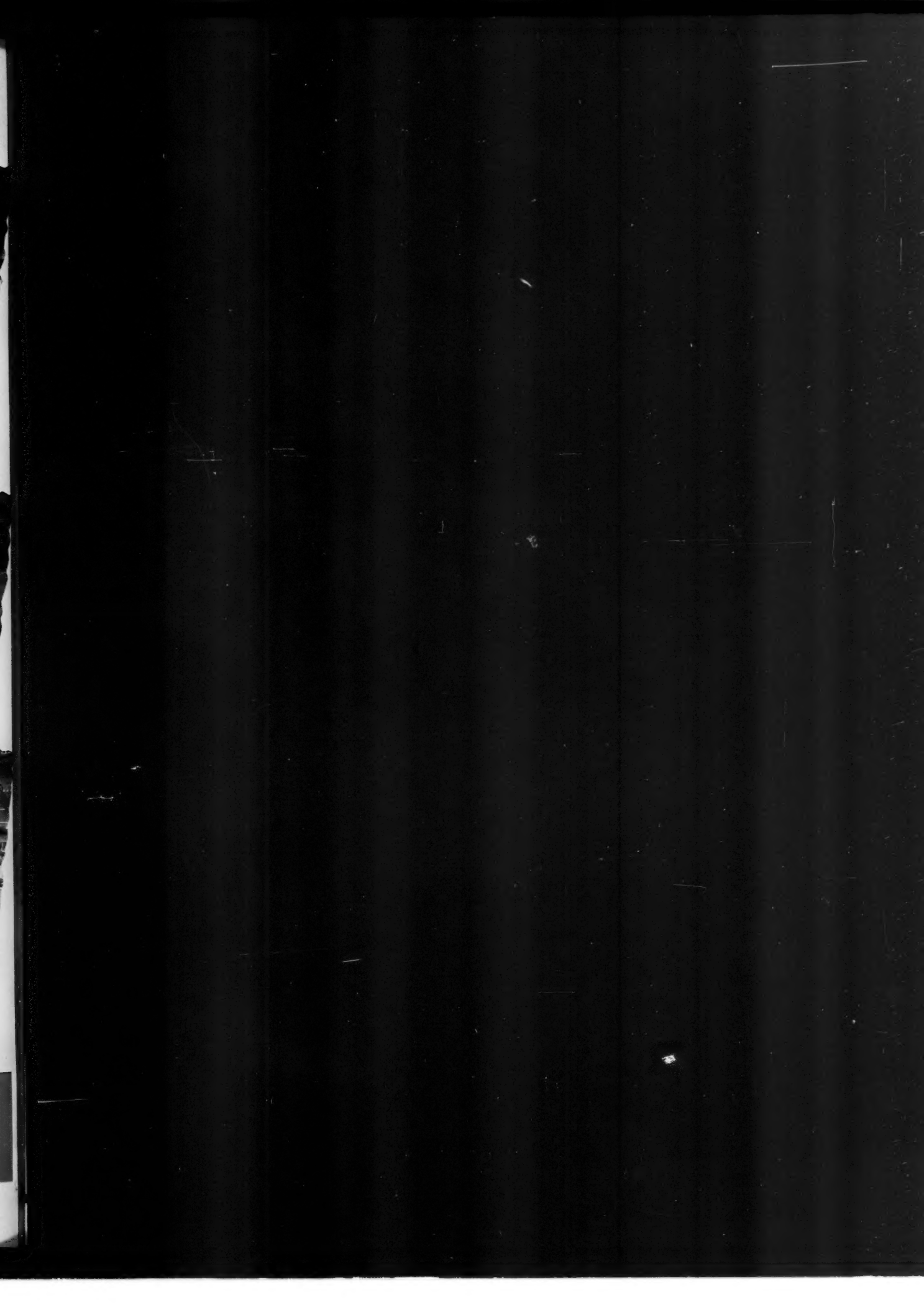
FOR ANY PROCESS, PRODUCT OR PRODUCTION

Salem-Ohio